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FIRST FIVE YEAR REVIEW REPORT NWS EARLE NJ (PUBLIC DOCUMENT)

2/1/2003

TETRA TECH

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Project Number 2128

February 27, 2003

Engineering Field Activity Northeast
Naval Facilities Engineering Command
10 Industrial Highway Mail Stop No. 82
Lester, Pennsylvania 19113-2090

Attn: Ms. M. DiGeambeardino, Code EV21/MD

Reference: Contract No. N62467-94-D-0888
Contract Task Order (CTO) No. 843

Subject: Submission of Final First Five-Year Review Report
NWS Earle - Colts Neck, New Jersey

Dear Ms. DiGeambeardino:

Tetra Tech NUS, Incorporated (TtNUS) is pleased to provide copies of the subject document. Three copies have been sent to Jessica Mollin at EPA, Region II, three copies have been sent to Bob Marcolina at NJDEP, two copies have been sent to Larry Burg at NWS Earle, and three copies are enclosed for your use.

Thank you for this opportunity to submit the documents. Do not hesitate to contact me if you have any questions or require revisions.

Sincerely,

Russell E. Turner
Project Manager

RET/vh

Enclosures

c: Larry Burg (NWS Earle)
Jessica Mollin (EPA, Region II)
Bob Marcolina (NJDEP)
Garth Glenn (TtNUS) (without enclosures)
File

First Five - Year Review Report

NAVAL WEAPONS STATION EARLE

Colts Neck, New Jersey

Engineering Field Activity Northeast
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0843

February 2003

TETRA TECH NUS, INC.

FIRST FIVE-YEAR REVIEW REPORT

NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Engineering Field Activity Northeast
Environmental Branch Code EV2
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Submitted by:
Tetra Tech NUS, Inc.
600 Clark Avenue, Suite 3
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CONTRACT NUMBER N62467-94-D-0888
CONTRACT TASK ORDER 0843

FEBRUARY 2003

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ACRONYMS

µg/Kg	micrograms per kilogram
µg/L	micrograms per liter
4,4'-DDT	1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane
ARAR	applicable or relevant and appropriate requirements
AS/SVE	air sparging/soil vapor extraction
AWQC	Ambient Water Quality Criterion
B&RE	Brown and Root Environmental
CEA	classification exception area
CERCLA	Comprehensive Response, Compensation, and Liability Act
CPT	cone penetrometer
CFR	Code of Federal Regulations
cm/sec	centimeters/second
COPC	chemical of potential concern
CQA	Construction Quality Assurance
CQC	Construction Quality Control
CTE	central tendency exposure
DCA	dichloroethane
DCE	dichloroethene
DOD	Department of Defense
DON	Department of the Navy
EA	EA Engineering, Science, and Technology
ECOC	ecological contaminant of concern
EFANE	Engineering Field Activity Northeast
ERA	Ecological Risk Assessment
ER-L	Effects Range-Low
FFA	Federal Facilities Agreement
FS	Feasibility Study
ft/day	feet/day
FWENC	Foster Wheeler Environmental Corporation
HASP	Health and Safety Plan
HEAST	Health Effects summary tables
HHRA	human health risk assessment
HI	Hazard Index
IAS	Initial Assessment Study
IC	Institutional Controls

IEUBK	Integrated Exposure Uptake Biokinetic
IR	Installation Restoration
IRIS	Integrated risk information system
IRP	Installation Restoration Program
K_{oc}	organic carbon partition coefficent
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
MQA	Material Quality Assurance
msl	mean sea level
NCEA	National Center for Exposure analysis
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No Further Action
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
NWS	Naval Weapons Station
O&M	operations and maintenance
OME	Ontario Ministry of Environment
OU	Operable Unit
PAH	Polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PP	Proposed Plan
PRG	Preliminary Remediation goal
RAB	Restoration Advisory Board
RAC	Remedial Action Contractor
RAO	remedial action objectives
RBC	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RfD	Reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
SF	Slope factor
SVOC	semivolatile organic compounds
TAL	Target Analyte List

TBC	to be considered
TCE	trichloroethene
TCL	Target Compound List
TPH	total petroleum hydrocarbons
TtNUS	Tetra Tech NUS, Inc.
U.S.	United States
USEPA	United States Environmental Protection Agency
VC	vinyl chloride
VOC	volatile organic compound

1.0 INTRODUCTION

The Navy, in conjunction with the United States Environmental Protection Agency (USEPA) Region 2 and the New Jersey Department of Environmental Protection (NJDEP), has conducted the first five-year review of the remedial actions implemented at the Naval Weapons Station (NWS) Earle in Colts Neck, New Jersey. The National Superfund electronic database identification number for NWS Earle is NJ0170022172. This review has been prepared by Tetra Tech NUS, Inc. (TtNUS) under Contract Task Order 0843, as part of the United States Navy Installation Restoration Program (IRP) for the Department of the Navy (DON), Engineering Field Activity Northeast (EFANE) Naval Facilities Engineering Command, under Contract Number N62467-94-D-0888. TtNUS conducted the five-year review of pending, completed, and ongoing remedial actions implemented at Installation Restoration (IR) sites at NWS Earle. A detailed review of six sites where remedial activities have been initiated since February 1998 and site-related contaminants remain at levels above those that would allow for unrestricted use is included in this five-year review document. A general site location map of NWS Earle is shown on Figure 1. The Mainside area is shown on Figure 1-1 and Figure 1-2 shows the Waterfront area. Locations of the six sites that are included in this five-year review are shown on Figure 1-3.

1.1 OVERVIEW OF FIVE-YEAR REVIEW PROCESS

The purpose of the five-year review is to determine if the remedies selected and implemented for the sites continue to be protective of human health and the environment. The methods, findings, and conclusions of the reviews are documented in this Five-Year Review report. In addition, this Five-Year Review report identifies deficiencies found, if any, during the review and provides recommendations to address them.

This review is required by statute. The Navy must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c), as amended, states:

> *"If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with Section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews* (USEPA, 2001)".

USEPA interpreted this requirement further in the NCP Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) which states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action* (USEPA, 2001)."

This is the first five-year review of sites at NWS Earle. The triggering action for this review is the initiation of the remedial actions for Site 4 - Landfill West of "D" Group and Site 5 – Landfill West of Army Barricades that began in February 1998. Because hazardous substances remain at six sites above levels that allow for unrestricted use and unlimited exposure, five-year reviews are required as described in the Records of Decision (RODs) for the six sites included in this report.

As discussed in the USEPA Comprehensive Five-Year Review Guidance (USEPA, 2001), a five-year review determines whether the remedy at a site is protective of human health and the environment. Where a remedial action is still under construction, a five-year review determines whether immediate threats have been addressed and whether the remedy is expected to be protective when the remedial actions are completed. In addition, a five-year review identifies deficiencies and recommends steps to correct them. To do this, the technical assessment conducted during a five-year review examines the following three questions:

- Is the remedy functioning as intended by the decision documents?
- Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
- Has any other information come to light that could call into question the protectiveness of the remedy?

These questions will be answered in Sections 2.0 through 7.0 for the six sites at NWS Earle where a remedy has been implemented or is currently being implemented. To answer these questions, this five-year review consisted of several steps including a review of documents, interviews with personnel associated with the sites, and a site inspection for each site. This report also includes the findings of a review of newly promulgated standards, and changes in the standards that were identified as applicable or relevant and appropriate requirements (ARARs) at the time the ROD, criteria to be considered (TBCs), and the factors used to develop site-specific, risk-based levels. This information was reviewed for sites where RODs were signed and where changes since the time of the ROD may call into question the

protectiveness of the remedy. No recalculation of risk or reassessment of risk was necessary to determine whether a remedy protects human health and the environment. Remediation goals were largely determined by the NJDEP clean-up criteria that remain unchanged for these six sites. Where applicable, monitoring and sampling data and the documentation of operations and maintenance (O&M) are also examined and included in the subsequent site-specific sections.

1.2 OVERVIEW OF NWS EARLE

NWS Earle covers approximately 11,100 acres in Monmouth County, New Jersey. Since the early 1940s, the United States (U.S.) Navy has renovated, stored, and maintained munitions at the Station. These operations involve preserving and maintaining ammunition, missile components, and explosives. NWS Earle also provides housing for Navy personnel and their families (500 homes are on the Base). The Facility's primary mission is to supply ammunition to the naval fleet. An estimated 2,500 people either work or live at NWS Earle. The following sections provide the physical and geologic conditions at NWS Earle as well as a history and chronology of environmental events at the Station.

1.2.1 Land Use and Characteristics

NWS Earle is located in Monmouth County, New Jersey, approximately 47 miles south of New York City. The Station consists of two areas, the Main Base (Mainside area), located inland, and the 706-acre Waterfront area. The two areas are connected by a Navy-controlled right-of-way. The Mainside area is located in Colts Neck Township, which has a population of approximately 12,500 people. The surrounding area includes agricultural land, vacant land, and low-density housing. The Mainside area includes a large, undeveloped portion associated with ordnance operations, production, and storage; this portion is encumbered by explosive safety quantity distance arcs. Other land use in the Mainside area includes residences, offices, workshops, warehouses, recreational space, open space, and undeveloped land. The Waterfront area is located in Middletown Township, which has a population of approximately 68,200 people.

NWS Earle is located in the coastal lowlands of Monmouth County, New Jersey, within the Atlantic Coastal Plain Physiographic Province. The Mainside area lies in the outer Coastal Plain, approximately 10 miles inland from the Atlantic Ocean. The Mainside area is relatively flat, with elevations ranging from approximately 100 to 300 feet above mean sea level (msl). The most significant topographic relief within the Mainside area is in Hominy Hills, a northeast-southwest-trending group of low hills located near the center of the Station.

The rivers and streams draining NWS Earle ultimately discharge to the Atlantic Ocean, approximately 9 or 10 miles east of the Mainside area. The headwaters and drainage basins of three major Coastal Plain rivers (Swimming, Manasquan, and Shark) originate on the Mainside area. The northern half of Mainside is in the

drainage basin of the Swimming River with tributaries including Mine Brook, Hockhockson Brook, and Pine Brook. The southwestern portion of the Mainside drains to the Manasquan River via either Marsh Bog Brook or Mingamahone Brook. The southeastern corner of the Mainside drains to the Shark River. Both the Swimming River and the Shark River supply water to reservoirs used for public water supplies. Local surface water is used for recreation and crop irrigation.

The New Jersey Coastal Plain is a seaward-dipping wedge of unconsolidated Cretaceous to Quaternary sediments that were deposited on a pre-Cretaceous basement-bedrock complex. The Coastal Plain sediments are primarily composed of clay, silt, sand, and gravel and were deposited in continental, coastal, and marine environments. The sediments generally strike northeast-southwest and dip to the southeast at a rate of 10 to 60 feet per mile. The approximate thickness of these sediments beneath NWS Earle is 900 feet. The pre-Cretaceous complex consists mainly of PreCambrian and lower Paleozoic crystalline rocks and metamorphic schists and gneisses. The Cretaceous to Miocene Coastal Plain Formations are either exposed at the surface or subcrop in a banded pattern that roughly parallels the shoreline. The outcrop pattern is caused by the erosional truncation of the dipping sedimentary wedge. Where these formations are not exposed, they are covered by essentially flat-lying post-Miocene surficial deposits.

Groundwater classification areas were established in New Jersey under NJDEP Water Technical Programs Groundwater Quality Standards in New Jersey Administrative Code (N.J.A.C.) 7:9-6. The Mainside area is located in Class II-A: Groundwater Supporting Potable Water Supply area. Class II-A includes those areas where groundwater is an existing source of potable water with conventional water supply treatment or is a potential source of potable water. In the Mainside area, in general, the deeper aquifers are used for public water supplies and the shallower aquifers are used for domestic supplies.

The facilities located in the Mainside administration area are connected to a public water supply (New Jersey American Water Company). Water for the public supply network comes from surface water intakes, reservoirs, and deep wells. No public water supply wells or surface water intakes are located on the NWS Earle facility. A combination of private wells and public water supply from the New Jersey American Water Company serves businesses and residences in areas surrounding the Mainside facilities. There are a number of private wells located within a 1-mile radius of NWS Earle and several within the NWS Earle boundaries. The majority of these wells are used for potable supplies; previous testing for drinking water parameters indicates these wells have not been adversely impacted. An estimated 320 private and municipal wells serve 1,200 people within a 3-mile radius of the Station, and groundwater also is used for irrigation.

There is a rich diversity of ecological systems and habitats at NWS Earle. Knieskern's beaked-rush (*Rynchospora knieskernii*), a sedge species on the federal endangered list, has been seen on the Station,

and some species on the New Jersey endangered list, such as the swamp pink (*Helonias bullata*), may be present. An osprey has visited Mainside and may nest in another area at NWS Earle. The Mingamahone Brook supports bog turtles downstream of the Mainside area and provides an appropriate habitat for them at the Mainside area.

1.2.2 History and Site Chronology

Important NWS Earle historical events and relevant dates in the site chronology are listed in the following table. The identified events are illustrative, not comprehensive.

Event	Date
Navy officially commissions NWS Earle	1943
Initial Assessment Study (IAS) completed	1982
USEPA proposes that NWS Earle be added to the National Priorities List (NPL)	1984
Phase I Site Inspection/IRP Phase II Confirmation Study	1986
Current Situation and Plan of Action	1988
Placed on the NPL	August 1990
Federal Interagency Agreement Signed	1991
Environmental Investigation Photographic Center Studies	1992
Phase II Site Inspection Study	1993
Remedial Investigation (RI) completed	1996

Potential hazardous substance releases at NWS Earle were addressed in an IAS in 1982 that was conducted by Fred C. Hart and Associates, an IRP Phase II Confirmation Study in 1986 by Roy F. Weston, Inc., and a RI in 1996 by Brown and Root Environmental. These were preliminary investigations to determine the number of sources, compile histories of waste-handling and disposal practices at the sites, and acquire data on the types of contaminants present and potential human health and/or environmental receptors.

In 1990, NWS Earle was placed on the NPL, a list of sites where uncontrolled hazardous substance releases may potentially present serious threats to human health and the environment. The sites at NWS Earle were subsequently investigated during the RI to determine the nature and extent of contamination at these sites. RI activities included installation and sampling of groundwater monitoring wells, surface water and sediment sampling, and surface and subsurface soil sampling.

Twenty-seven areas of concern at NWS Earle were identified for potential cleanup under CERCLA, and three areas are permitted under the Resource Conservation and Recovery Act (RCRA). In addition,

potential sites have been identified since the RI was performed and are being investigated by the Navy in cooperation with USEPA and NJDEP.

Wastes generated from weapons maintenance activities included grit and paint chips from sandblasting, paint scrapings, solvent and paint sludges as well as metal residues including lead, zinc, and chromium. Lead bullets from small arms practice were encountered in ranges. Municipal-type waste, wood dunnage materials, and wastes from vehicle maintenance were encountered in former landfills.

The RI recommended removal actions/closure at six sites (Sites 20, 22, 23, 24, 25, and 27). These removal actions generally consisted of the excavation and treatment or off-site disposal of the contaminated media. Additionally, USEPA and the Navy agreed, based on the RI data, that seven sites (Sites 3, 6, 12, 13, 16/F, 17, and 26) required additional sampling to develop feasibility study alternatives. The additional sampling work was conducted between October 1996 and January 1997. One of these sites, Site 16/F (fuel spill), was subsequently transferred to the CERCLA program and is being remediated as part of the underground storage tank program in cooperation with NJDEP.

For Sites 3, 4, 5, 10, 19, and 26, the RI recommended Feasibility Studies (FSs) and preparation of Proposed Plans (PPs) and RODs. The Remedial Designs (RDs) for Sites 3, 4, 5, 10, 19, and 26 have been completed and implemented.

1.2.3 Site Information

This Five-Year Review report addresses the six IR sites at NWS Earle that have approved final RODs requiring long-term monitoring and five-year review. The USEPA and Navy assigned Operable Unit (OU) designations to the sites at NWS Earle after the RI was completed to combine similar sites into a joint decision-making process. These OU designations are not used in the project documents prior to the FS but are based on similarities in site conditions and compounds of concern. These OU designations grouped the sites based on the types of contaminants detected or the type of site or the contaminated media. The sites included in the review and the rationale for including them is provided below.

- OU 1, Site 4 – Landfill West of "D" Group
- OU 1, Site 5 – Landfill West of Army Barricades
- OU 2, Site 19 – Paint Chip and Sludge Disposal Site
- OU 3, Site 26 – Explosive "D" Washout Area
- OU 6, Site 3 – Landfill Southwest of "F" Group
- OU 6, Site 10 – Scrap Metal Landfill

This five-year review is a statutory five-year review conducted at OU 1 and OU 6 because upon completion of the remedial actions, hazardous substances, pollutants, or contaminants remain above levels that allow for unlimited use and unrestricted exposure. This Five-Year Review was conducted as a matter of policy at OU 2 and OU 3 because no hazardous substances remain in the soil that would limit use or restrict exposure, but the groundwater cleanup levels specified in the ROD will require 5 or more years to attain.

A ROD for No Further Action (NFA) at OU 4, Sites 14, 22, 24, 25, and 29 and Institutional Controls (ICs) at OU 4, Sites 20, 23 and 27 was completed in September 1999 (DON, 1999). The ROD for OU-4 does not include long-term monitoring of five-year reviews.

A ROD is pending for proposed remedial action consisting of placement of a landfill cap, long-term monitoring, and ICs at OU 5 (Site 13). FSs were under development for OU 8 (Sites 1 and 11) and OU 9 (Sites 6, 12, 15, and 17) at the time this five-year review was performed. OU 5, OU 8 and OU 9 sites were not included in this five-year review because no ROD had been approved to identify a selected remedial action and no remedial actions had commenced at these sites at the time of the review.

1.3 FIVE-YEAR REVIEW PROCESS

The NWS Earle five-year review was led by Michele DiGeambeardino, the DON Remedial Project Manager. The following team members assisted in the review:

- Jessica Mollin, USEPA Region 2 Remedial Project Manager
- Robert Marcolina, NJDEP Remedial Project Manager
- John Mayhew, DON EFANE Technical Lead
- Lawrence Burg, NWS Earle IRP Coordinator
- Russell Turner, TtNUS Project Manager
- Robert Davis TtNUS Project Engineer

This five-year review consisted of the following activities: a review of relevant documents, site inspections, and limited interviews. This final report will be placed in the information repository at the Monmouth County Library, Eastern Branch, Route 35, Shrewsbury, New Jersey to give the public the opportunity to review and comment on the report.

A notice of availability of the draft Five-Year Review report will be provided to the public in the local newspaper (*Asbury Park Press).*

1.4 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND SITE-SPECIFIC ACTION LEVEL CHANGES

The chemical-specific ARARs identified in each of the RODs were reviewed, as were new federal and State regulations that have been promulgated. This section considers potential impacts of new or changed ARARs on potential risk posed to human health or the environment. This analysis determined that recalculation of risk or risk assessments to determine whether a remedy continues to protect human health and the environment as planned were not necessary for any of the six sites covered by this five-year review.

The human health risk assessments (HHRAs) for the sites were conducted primarily following USEPA guidance documents from 1989 (Risk Assessment Guidance for Superfund - Volume I - Human Health Evaluation Manual Part A - Interim Final), 1991 (Risk Assessment Guidance for Superfund - Volume I: Human Health Evaluation Manual - Supplemental Guidance - "Standard Default Exposure Factors" - Interim Final), and 1992 (Dermal Exposure Assessment: Principles and Applications). There have been no significant revisions in the methodology for human health risk assessments since the RI was prepared.

The benchmarks used to evaluate chemicals of potential concern (COPCs) for direct contact with soil and sediment included USEPA Region III Risk-Based Concentrations (RBCs) and NJDEP Cleanup Standards for Contaminated Sites. In addition, USEPA Soil Screening Levels for the protection of migration from soil to groundwater and soil to air and NJDEP Cleanup Standards for Contaminated Sites for pollutant mobility and volatilization from soil to indoor air were used to select COPCs for soil migration pathways. The USEPA Region III RBCs are usually updated twice a year, and the USEPA Region IX preliminary remediation goals (PRGs) are usually updated once a year. The NJDEP Cleanup Standards for Contaminated Sites rule (N.J.A.C. 7:26D) was issued on February 3, 1992 and revised in May 1999.

The benchmarks used to select COPCs for groundwater included USEPA Region III RBCs, USEPA Maximum Contaminant Levels (MCLs), NJDEP Ground Water Quality Standards (N.J.A.C. 7:9-6) and the New Jersey State Surface Water Quality Standards (N.J.A.C. 7:9B).

The benchmarks used to select COPCs for surface water included USEPA Ambient Water Quality Criteria (AWQCs) and New Jersey State Surface Water Quality Standards (N.J.A.C. 7:9B). The USEPA AWQCs were last updated in April 1999.

The benchmarks used to calculate cancer and noncancer risks include USEPA's Integrated Risk Information System (IRIS), USEPA's Health Effects Assessment Summary Tables (HEAST), and USEPA's National Center for Exposure Analysis (NCEA) Regional Support Provisional Service.

In general, most of the changes in the updated documents are not expected to significantly change the overall conclusions of the HHRAs. Some of the RBC criteria for tap water ingestion or direct contact with soil are lower in the updated documents, and some of the values are higher. Therefore, different chemicals might be retained as COPCs during the screening if it was conducted at present. However, the decision to remediate a site is typically not based on screening benchmarks because their conservative nature.

Some of the cancer slope factors (SFs) and noncancer reference doses (RfDs) have been changed, withdrawn, or added. Therefore, risks might be slightly different if the HHRAs were conducted at present. Also, some of the dermal exposure parameters have been changed slightly with the issuance of the 2001 update to USEPA dermal exposure guidance; however, the underlying methods for dermal exposure assessment were not changed, and the recommended dermal exposure factors and chemical-specific contstants were only slightly altered due to re-evaluation of the same data sources by a USEPA workgroup. Overall, the decision to remediate or not remediate based on risk assessment results would not be affected, and the regulatory criteria selected for monitoring would still be the MCLs and NJDEP standards for groundwater and AWQCs and NJDEP criteria for surface water.

The ecological risk assessments for the sites were conducted primarily following USEPA Ecological Risk Assessment (ERA) guidance documents from 1992 (Framework for Ecological Risk Assessment) and 1994 (Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Review Draft). The 1994 ERA guidance did not change significantly when it was updated in 1997 as an interim final document (USEPA, 1997). The risk assessments also reevaluated some of the conservative assumptions used to obtain a "screening-level" risk, which corresponds to the Step 3a evaluation in the Navy Policy for Conducting Ecological Risk Assessments (DON, 1999). Therefore, the risk assessment methodology has not changed significantly since the RI was prepared.

At sites where food-chain modeling was conducted, exposure factors were obtained from the Wildlife Exposure Factors Handbook (USEPA, 1993b). This document is still the primary source for exposure factors in current ecological risk assessments. Also, many of the wildlife toxicity data were obtained from the Toxicological Benchmarks for Wildlife: 1994 Revision (Opresko et al., 1994). This document was updated in 1996 (Sample et al., 1996); however, many of the values did not change. Some of the uncertainty factors applied to the toxicity data are currently not standard practice, but most of the uncertainty factors were removed when the less conservative exposure scenarios were presented.

The benchmarks used to select ecological contaminants of concern (ECOCs) were obtained from different sources because there is no single document that contains criteria for all the chemicals typically

detected in the range of environmental media encountered at these sites. The following paragraphs briefly discuss the primary sources of benchmarks used in the ERAs and whether or not they have been updated.

The primary source of surface water benchmarks was the New Jersey chronic Surface Water Quality Standards. Many of these standards are based on the USEPA AWQCs that were updated in April 1999 (USEPA, 1999a). Therefore, it is likely that the New Jersey surface water quality standards will be updated in the near future to reflect the changes in the USEPA AWQCs. Also, the USEPA AWQCs (before their update in 1999) were used for some chemicals. Other surface water benchmarks were based on the Ecotox Thresholds (USEPA, 1996a). Several of the values in the Ecotox Thresholds were updated in Suter and Tsao, 1996. Toxicity data from the literature were used as benchmarks for chemicals not listed in the above documents.

The primary sources of sediment benchmarks were site-specific benchmarks based on equilibrium partitioning using site-specific total organic carbon values, surface water benchmarks, and chemical-specific organic carbon partition coefficient (Koc) values. Because some of the surface water benchmarks were updated, some of the sediment benchmarks will change. Other sediment benchmarks used included the Effects Range-Low (ER-L) values from Long et al., (1995), the Sediment Quality Guidelines from the Ontario Ministry of Environment (OME, 1992), and the Washington State Freshwater Apparent Effects Thresholds (Washington State, 1994). The ER-L values have not been updated and are still being used as sediment benchmarks in current ERAs. The OME (1992) and Washington State (1994) documents were updated in 1993 (OME, 1993) and 1997 (Cubbage et al., 1997), respectively. Several of the values were revised in the updates.

For soil, benchmarks for plants were primarily obtained from Will and Suter (1994), and benchmarks for soil invertebrates were primarily derived from ECOSAR (USEPA, 1994b). The Will and Suter document was updated by Efroymson et al., (1997a). Also, Efroymson et al. (1997b) developed a screening benchmark document for earthworms that is currently being used for soil benchmarks. The plant benchmarks in Efroymson et al. (1997a) are very similar to those in Will and Suter (1994). Efroymson et al. (1997b) has some earthworm benchmarks for chemicals that did not have values in ECOSAR.

In general, most of the changes in the updated documents are not expected to significantly change the overall conclusions of the ERAs. Some of the benchmarks are lower in the updated documents, and some of the values are higher. Therefore, different chemicals might be retained as ECOCs during the screening if it was conducted at present. However, the decision to remediate a site is typically not based on screening benchmarks because of their conservative nature. A decision to remediate a site or decision on cleanup levels typically consists of other factors such as the collection of site-specific

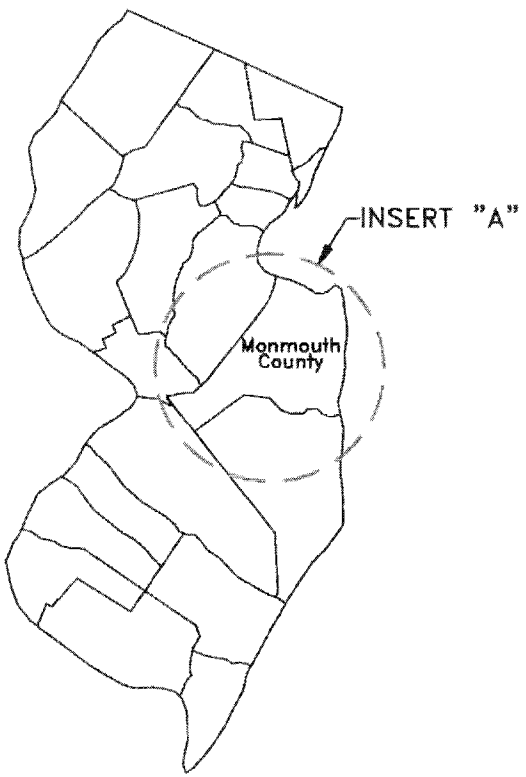
biological data (i.e., toxicity tests, biological surveys). The site-specific data would not be changed because of updates in the screening benchmarks.

1.5 REPORT ORGANIZATION

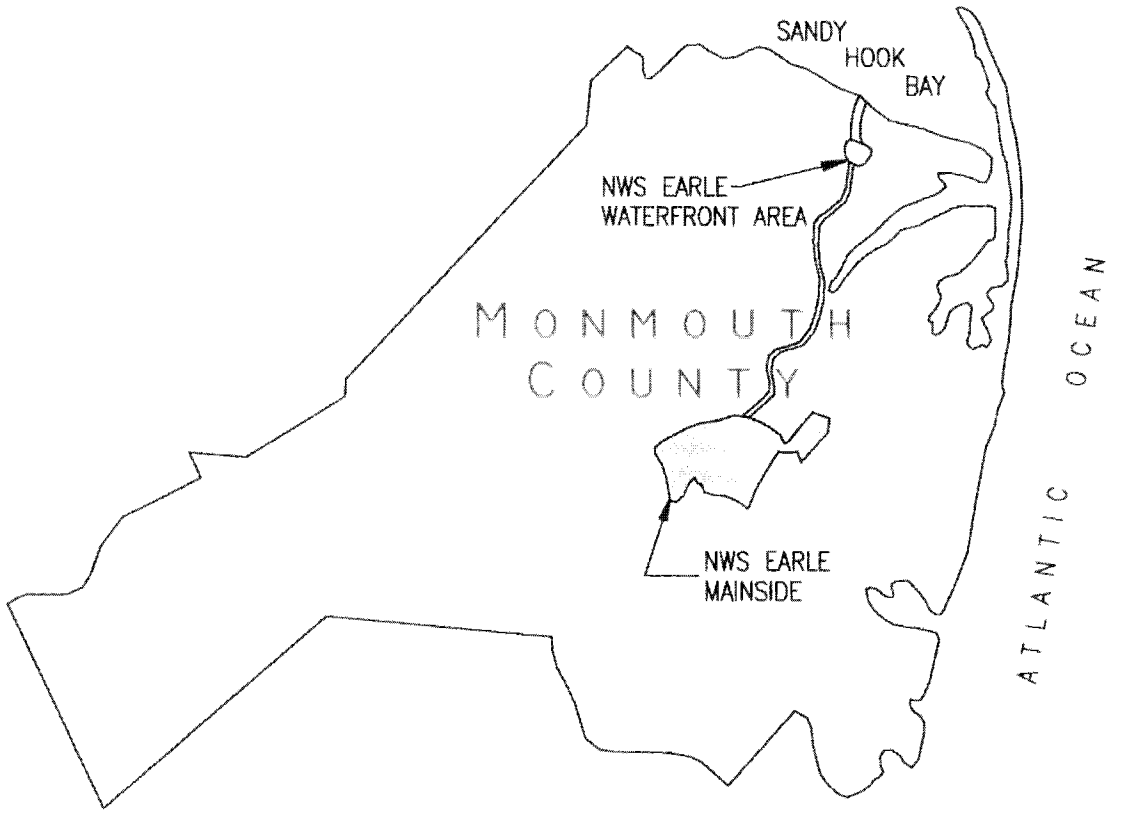
This report has been organized to meet the general format requirements specified in the Comprehensive Five-Year Review Guidance document (USEPA, 2001). Each of the six NWS Earle IR sites requiring five-year review at this time is summarized in a separate section.

Section 1.0 gives an overview of the NWS Earle, the five-year review process conducted for NWS Earle, and a discussion of ARARs and site-specific remediation goals. Sections 2.0 through 7.0 include the five-year reviews conducted for the individual sites. Section 8.0 provides a general summary, conclusions, and protectiveness statement for NWS Earle. Section 8 also identifies when the next five-year review is required and the tasks that should be performed as part of that five-year review. Five appendices are included in this report. Appendix A contains photographs of each of the sites. Appendix B contains the five-year review inspection checklists for the reviews that were conducted. Appendix C contains the agreement changing monitoring frequency at Site 19 from quarterly to annual. Appendix D contains a letter from USEPA approving the remedial action at Sites 3 and 10 (OU 6).

Five-Year Review\2128cm01.dwg 12/31/02 LDL



STATE OF NEW JERSEY

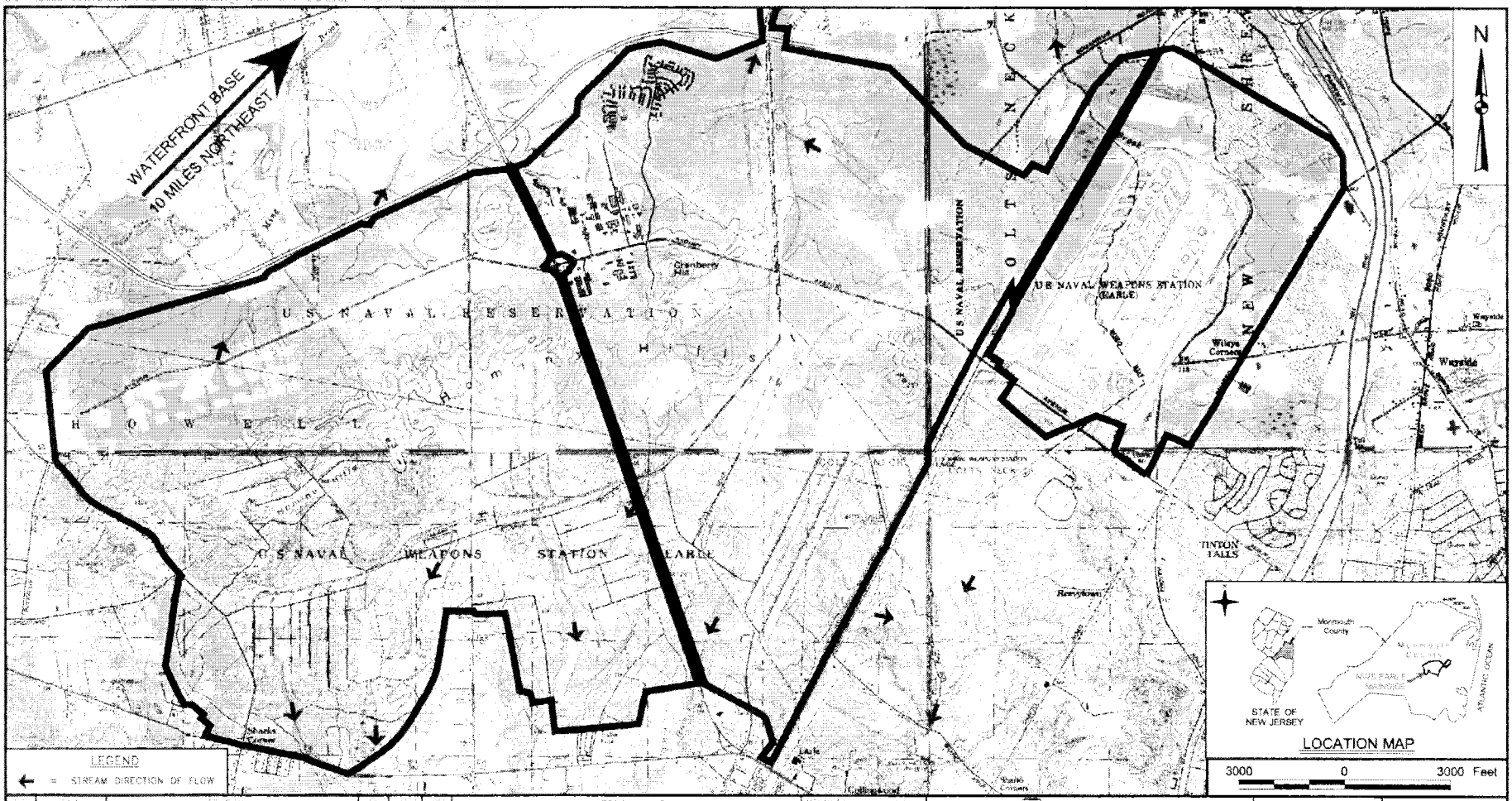


INSERT "A"

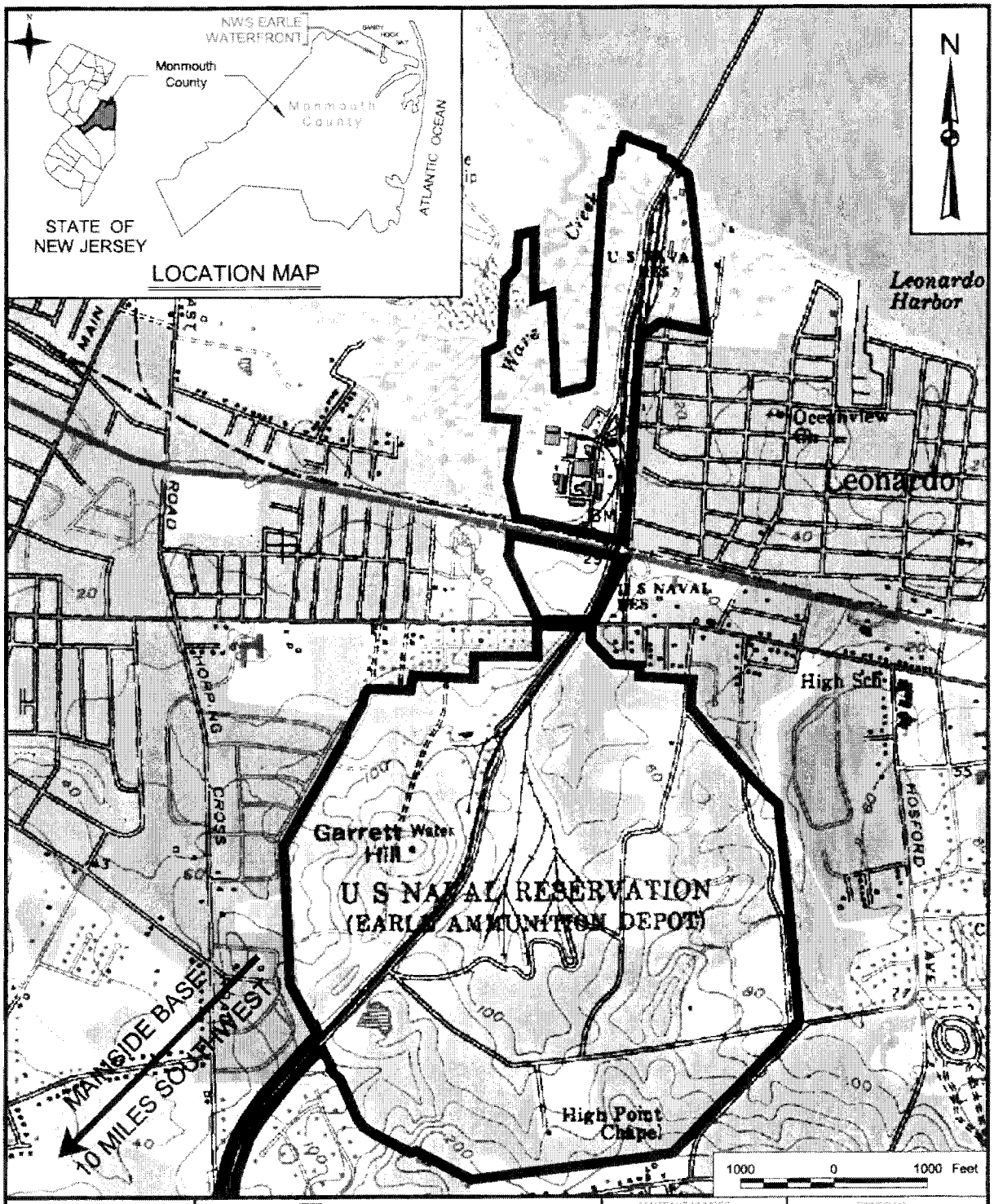
TETRA TECH NUS, INC.

SITE LOCATION MAP
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY

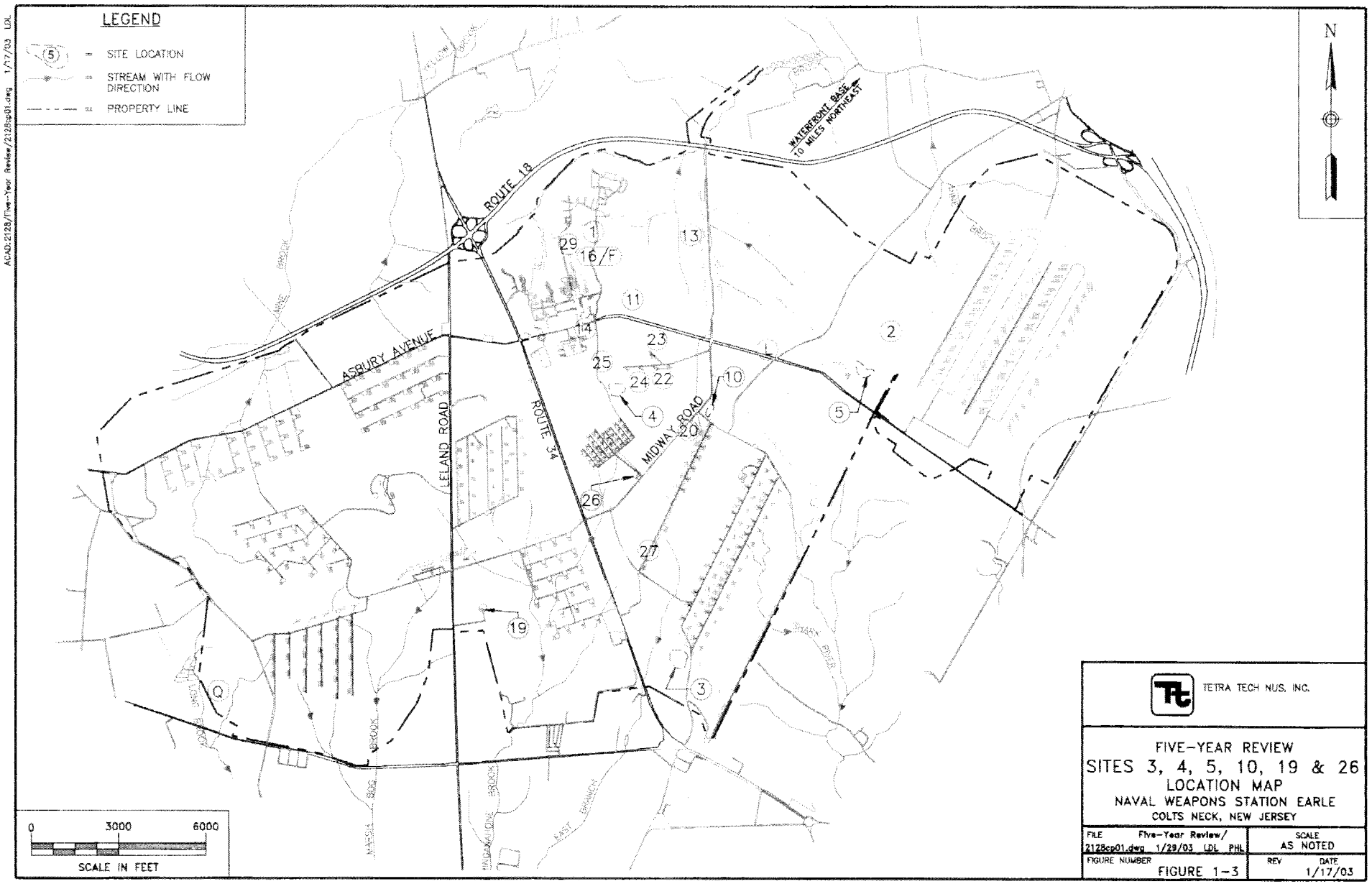
SCALE	NONE
FILE	2128cm01.dwg
	1/17/03 LDL PHL
REV	DATE 1/3/03
FIGURE NUMBER	FIGURE 1



				LDI 1/15/03	Tetra Tech NUS, Inc.	2128	FIVE-YEAR REVIEW
				RFD 2/6/03	MAINSIDE GENERAL LOCATION MAP FIVE-YEAR REVIEW NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	NWS-EARLE_FIVE-YEAR REVIEW.apr MAINSIDE SITE	
			ASBURY PARK, N.J. 40074-B1 U.S.G.S. 7.5 MINUTE QUAD. MAP. 1980				
			FARMINGDALE, N.J. 40074-B2 U.S.G.S. 7.5 MINUTE QUAD. MAP. 1989				
			LONG BRANCH SW, N.J. 40073-C8 U.S.G.S. 7.5 MINUTE QUAD. MAP. 1965				
			MARLBORO, N.J. 40074-A2 U.S.G.S. 7.5 MINUTE QUAD. MAP. 1981	AS NOTED		RET 2/26/03	
						FIGURE 1-1	



DRAWN BY: LDL	DATE: 1/31/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER NO: FIVE-YEAR REVIEW
CHECKED BY: RFD	DATE: 2/6/03	WATERFRONT GENERAL LOCATION MAP FIVE-YEAR REVIEW NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-EARLE_FIVE-YEAR REVIEW.apr LAYOUT: WATERFRONT SITE
CAD STANDARD FILENAME:			APPROVED BY: RET / DATE: 2/26/03
SCALE: AS NOTED			DRAWING NO: FIGURE 1-2 / REV:


LEGEND
SITE LOCATION
STREAM WITH FLOW DIRECTION
PROPERTY LINE
N
ROUTE 18
WATERFRONT BASE
10 MILES NORTHEAST
ASBURY AVENUE
LELAND ROAD
ROUTE 34
MIDWAY ROAD
ROUTE 10
0
3000
6000
SCALE IN FEET
TETRA TECH NUS, INC.
FIVE-YEAR REVIEW
SITES 3, 4, 5, 10, 19 & 26
LOCATION MAP
NAVAL WEAPONS STATION EARLE
COLTS NECK, NEW JERSEY
FILE Five-Year Review/ 2125cp01.dwg 1/29/03 LDL PHL
SCALE AS NOTED
FIGURE NUMBER FIGURE 1-3
REV
DATE 1/17/03

2.0 OPERABLE UNIT 1, SITE 4 – LANDFILL WEST OF "D" GROUP

Site 4 under the Navy's IRP includes the Landfill West of "D" Group. The landfill is a 5-acre site that was used to dispose of domestic and industrial wastes from 1943 to 1960. This five-year review of Site 4 is required by statute because hazardous substances, pollutants, or contaminants remain on site at concentrations that do not allow for unlimited use or unrestricted exposure. An interim remedial action for Site 4 was completed in September 1995, and the RD and remedial action (landfill cap) were completed in 1997 and 1999, respectively. The site has been monitored since the remedial action was completed to assess the effectiveness of the remedial action. Data collected during the monitoring program are evaluated within this report.

2.1 HISTORY AND SITE CHRONOLOGY

A list of important Site 4 historical events and relevant dates in the site chronology is shown below. The identified events are illustrative, not comprehensive.

Event	Date
Landfill operations.	1943 to 1960
Final IAS completed.	1982
Phase I Site Inspection/IRP Phase II Confirmation Study completed.	1986
Phase II Site Inspection completed	1993
Interim Remedial Action to stabilize the site completed.	1995
RI completed.	1996
FS completed.	1997
Proposed Plan issued.	March 1997
Public Meeting.	April 1997
ROD signed.	September 1997
RD completed.	November 1997
Remedial Action began.	February 1998
Remedial Action completed	September 1999
Final Report for Remedial Action issued.	May 25, 1999
Final O&M Manual for the Site 4 and Site 5 Landfills issued.	March 1999
Groundwater Monitoring Program initiated.	July 1999
Annual Groundwater Monitoring Program.	Ongoing

2.2 BACKGROUND

Site 4 is a 5-acre landfill that received approximately 10,200 tons of mixed domestic and industrial wastes from 1943 until 1960 (Figure 2-1). At this site, wastes were sometimes burned in trenches and then buried. Materials disposed of include metal scrap, construction debris, pesticide and herbicide containers, paint residues, and rinse water. It has been reported that containers of paint, paint thinners, varnishes, shellacs, acids, alcohols, caustics, and asbestos may have been disposed. The industrial wastes comprise only a small portion of the waste at the site. The landfilled materials were covered by a thin layer of sandy soil.

Site 4 was an open area surrounded by woodlands. The site was bordered by Macassar Road to the west and by an unpaved road to the north, east, and south. The ground surface sloped to the southeast from approximately 170 feet above msl near MW4-01 to approximately 150 feet above msl at MW4-06. Along the southeastern portion of the site, the fill face was approximately 25 feet high tapering to the original ground surface. A broad, low-lying wetland extends from the eastern portion of Site 4 beyond the unpaved boundary road. Surface water flow is to the east and east-southeast toward the wetland.

Regional geologic mapping identifies Site 4 as being within the outcrop area of the Cohansey Sand. The Cohansey Sand ranges between 0 and 30 feet in thickness. The lithology of the sediments encountered in the on-site borings, which extended to maximum depth of 25 feet, generally agreed with the published description of the Cohansey Sand. The thickness of the sediments penetrated in the on-site borings indicated the Cohansey Sand may have a regional thickness of greater than 30 feet. In general, the borings encountered alternating beds of light-colored, silty, fine- to coarse-grained sand with varying amounts of gravel. A 0.5-foot reddish-yellow clay seam was penetrated in one of the borings.

Groundwater in the Cohansey aquifer beneath the site occurs under unconfined conditions. The direction of shallow groundwater flow in the aquifer is toward the east and east-southeast. There does not appear to be a significant seasonal variation in groundwater flow direction. The hydraulic conductivity calculated in the RI report for MW4-04 is 4.48×10^{-4} cm/sec (1.27 ft/day).

The IAS determined that hazardous materials were potentially present and could impact groundwater. The Phase I Site Investigation detected low concentrations of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals in sediment samples receiving drainage from the site.

During the Phase II Site Investigation, groundwater samples showed elevated concentrations of VOCs, and subsurface soils showed elevated concentrations of a single pesticide (4,4'-DDT) and total petroleum hydrocarbons (TPH). Six test pits were excavated to characterize the waste materials in the landfill. The waste consisted primarily of metal scrap such as steel banding, pipes, and empty metal trash barrels.

Lumber, concrete, brick, and other construction debris were also encountered. No anomalous organic vapor readings were detected in any of the test pits.

Results of the RI showed the presence of VOCs including 1,2-dichloroethene (1,2-DCE), trichloroethene (TCE) and vinyl chloride (VC), and elevated concentrations of metals including aluminum, iron, lead, and manganese in groundwater. Elevated concentrations of metals including aluminum, iron, lead and manganese, and trace concentrations of pesticides including aldrin and dieldrin were detected in surface water samples. A single SVOC, nitrobenzene, was also detected at an elevated concentration (66.0 ug/kg) in a sediment sample. Figure 2-1 depicts sample locations. Table 2-1 summarizes the results of samples obtained from the groundwater monitoring wells during the RI (historical perspective) and long-term monitoring (current conditions) and compares them to applicable standards.

During the RI, organic compounds found in groundwater at concentrations above regulatory standards included TCE, 1,2-DCE and VC, in monitoring wells. VC was found at a concentration (3 ug/L) slightly above the federal (and State) standard for human consumption of groundwater (2 ug/L). VC was detected only during the RI sampling, not during any of the three rounds of Phase II Site Investigation sampling. The presence of 1,2-DCE and VC, both degradation products of TCE that were found slightly above the regulatory standard (VC and 1,2-DCE) but below the corresponding MCL (1,2-DCE), indicates that contaminants leaching from the limited source area are degrading with time.

From the RI, metals in groundwater were found at concentrations similar to background concentrations, although iron was detected in a downgradient well sample at a concentration greater than background and upgradient concentrations. Compounds found in groundwater at concentrations greater than regulatory guidelines included aluminum, iron, and manganese. However, there is no promulgated federal regulatory standard for these common groundwater constituents. Also, as discussed in the RI report, some of the metals concentrations found in groundwater samples may be attributable to sample turbidity when the low-flow sampling technique did not achieve the sample collection endpoint turbidity goal. In the case of Site 4, of six monitoring well samples collected, only one met the sample collection endpoint turbidity goal and another came near the goal. The other four samples collected had relatively high endpoint turbidity values, indicating that metals concentration results may be biased high for groundwater samples collected at Site 4.

Computer modeling estimated that Site 4 groundwater metals concentrations would gradually diminish over a long period of time assuming a source control measure such as capping would be implemented to control vertical migration. The model estimated that metals concentrations at the nearest potential discharge point, a stream located approximately 400 feet downgradient of Site 4, would be significantly less than either the State standards or background levels. The maximum distance from Site 4 where

metals concentration in groundwater would remain above applicable regulatory standards or background levels was estimated to be 55 feet by the model.

In summary, results of investigations at Site 4 indicate that:

- TCE found in one monitoring well at a concentration greater than the USEPA and NJDEP standards, and its degradation products found approximately at (VC) or near (1,2-DCE) the regulatory standard, indicate that contaminants leaching from the limited source area are degrading with time and are not wide spread.

- Metals found in groundwater at concentrations above NJDEP regulatory standards were limited to aluminum, iron, and manganese. There is no promulgated federal regulatory standard for these common groundwater constituents.

- Metals concentration results may be biased high for groundwater samples collected at Site 4 because of high sample endpoint turbidity values in four of the six samples collected.

- Modeling estimated that metals in groundwater will migrate only very little and that concentrations will diminish slowly with time.

The HHRA concluded that the cancer risk associated with future residential exposure from groundwater at Site 4 was conservatively estimated at 1×10^{-4}, the upper end of the acceptable risk range. This value is primarily attributable to VC, which was detected in one sample. Hazard Indices (His) for future residential exposure by groundwater exceeded 1.0, primarily due to barium and iron. Sample results also showed that VOCs (1,2-DCE and VC) and several metals (aluminum, iron, manganese) exceeded applicable groundwater standards.

The ERA concluded that contaminants do not appear to be significantly migrating to surface water and sediments in the wetlands via overland runoff and/or groundwater to surface water discharge at a level of ecological concern. Significant contaminant inputs from future discharge are unlikely because the landfill has been inactive since 1960, and the effect of discharge would most likely have already occurred.

2.3 REMEDIAL ACTIONS

Based on the results of the RI/FS process, it was determined that a remedial action was necessary for Site 4. A ROD for Site 4 was signed in September 1997 (DON, 1997a). The following sections describe the process used to select and implement the appropriate remedial action for Site 4.

2.3.1 Remedy Selection

An FS for Site 4 (Brown & Root Environmental [B&RE], 1997a) was completed in response to the recommendations of the RI. The FS evaluated several remedial alternatives. In the case of former landfill sites like Site 4, USEPA has undertaken the presumptive remedies initiative to speed up selection of remedial actions. Based on the expectation that containment would generally be appropriate for municipal landfill waste (such as that found at Site 4) and because the volume and heterogeneity of the waste generally make treatment impracticable, USEPA established containment as the presumptive remedy. Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soils, sediments, or groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail.

The FS concluded that capping, institutional controls, and long-term monitoring should be the preferred remedial alternative. The Navy, with the support of USEPA, and in consultation with NJDEP, selected this alternative, presented it in the PP in March 1997, and formally selected it in the ROD signed in September 1997. This alternative is in compliance with the USEPA presumptive remedy and includes a classification exception area (CEA) as required by the State groundwater quality protection criteria. The CEA covers the area immediately adjacent and downgradient of the landfill. Capping the landfill inhibits infiltration of groundwater through the landfill thus, in time, eliminating the groundwater contamination source. This alternative mitigates the potential exposure scenarios of direct exposure to landfill contents and consumption of contaminated groundwater from site and are protective of human health and the environment.

Based on ARARs and risk assessment results, the following RAOs were selected for Site 4:

- Prevent potential human exposure to contaminated landfill soil and materials
- Prevent potential human exposure to VOCs and metals in groundwater
- Minimize migration of landfill contaminants to groundwater and the adjacent wetlands (surface water and sediments) and restore the aquifer to the applicable standard.

The remedy that was selected for Site 4 meets the RAOs. The selected remedy is a containment option, as defined in the ROD, consisting of the following components:

- Institutional Controls - Institutional controls were enacted to limit future uses of the site that may result in disturbance of the soil cover or direct contact with contaminated media and to prohibit use of untreated contaminated groundwater. The institutional controls prevent potential human exposure to contaminated soils and landfilled materials. The institutional controls provide notice of hazardous materials at the site and ensure maintenance of cap integrity, worker protection, and other

considerations. Fencing and access restrictions provide additional long-term protection by limiting access to the capped area and restricting activities that could damage or intrude into the cover system and contaminated media. Because site groundwater does not meet New Jersey groundwater quality standards, a CEA pursuant to N.J.A.C. 7:9-6 was established to provide the State official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area (immediately adjacent to the landfill, near wells MW4-02 and MW4-05) is suspended until standards are achieved.

- Landfill Cover System (Capping) – A low-permeability cover system that complies with federal and State regulatory requirements, prevents potential human and animal contact with contaminants in landfill materials, limits contaminant leaching to groundwater, and minimizes contaminant migration via surface runoff and erosion was installed. The Navy maintains the cap.

- Groundwater Monitoring – Long-term, periodic monitoring is being conducted to assess contaminant status and potential threats to human health and the environment. The long-term, periodic monitoring program allows the Navy and regulatory agencies to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. Site conditions and risks are reviewed every 5 years because wastes have been left in place. Over time, the contaminants in groundwater will likely attenuate naturally through chemical and biological degradation (VOCs only) and physical processes (metals and VOCs). Metals concentrations in groundwater may decrease as a result of reduced infiltration of precipitation through landfill materials.

By regrading the landfill surface to preclude erosion, placing a cap over the landfill surface to avoid potential direct contact with landfill contents, and establishing a formal CEA to bar the use of site groundwater during the remediation period, the Navy has reduced the unacceptable risks associated with Site 4. While the RAO for groundwater protection was not be immediately achieved, risks have been reduced in relation to background by the elimination of infiltration and continued monitoring to evaluate contaminant trends. Long-term, periodic monitoring and analysis helps determine when this RAO will be achieved.

The remedy selected for Site 4 satisfied the remedy selection requirements of CERCLA and the NCP. Based on available information, the Navy believes the remedy is protective of human health and the environment, complies with ARARs (statutory requirements of USEPA, the State, and the local community), and is cost-effective.

2.3.2 Remedy Implementation

The RD for Site 4 began in August 1997. It was completed for the Navy by B&RE in November 1997 (1997b). Additional field work consisting of survey, geotechnical field investigation, and geotechnical laboratory testing was conducted to finalize construction details at the time of landfill cap construction.

Minor modifications to the cover system design were made as a result of normal refinement of details during the implementation. The components of the final cover system from top to bottom were as follows:

- Top Layer - protects the cover from erosion by rain or wind and from burrowing animals and is vegetated with permanent plant species such as grasses and legumes.

- Drainage Layer - prevents accumulation of water above the infiltration layer that could damage the geosynthetic clay or cause erosion of the top layer.

- Barrier Layer - minimizes precipitation infiltration into the landfill materials and, in accordance with applicable regulations and guidance, consists of a geosynthetic clay layer with a maximum permeability of 1×10^{-7} cm/s,

- Gas Collection Layer – provides a gas-permeable avenue through vents in the geosynthetic clay membrane to vent potential landfill gas.

- Subgrade - provides a well-compacted and smooth surface of sufficient thickness to prevent puncture of the barrier layer by landfill materials.

The Navy's Remedial Action Contractor (RAC) mobilized to the site to begin preliminary construction activities in February 1998, and the remedial action was completed in September 1999. Details regarding the remedial action are summarized in the Final Report for the Closure of Site 4 and 5 Landfills Foster Wheeler Environmental Corporation (FWENC). The most significant change to the remedial design that occurred during the remedial action was the inclusion under the cap of soil material that was excavated elsewhere from Site 4. This change resulted in a 2.8-foot elevation increase in one area of the landfill that necessitated modifications to the cover system installed along the slopes of three drainage channels.

To ensure of the quality of the remedial action, quality control testing and inspection were completed during the remedial action in accordance with the Construction Quality Control (CQC) Plan and the Material Quality Assurance (MQA) /Construction Quality Assurance (CQA) Plan. Two non-conformances

were noted during quality control testing and inspection, but neither was regarded as significant enough to affect the performance of the cap system.

The capital cost for implementation of the preferred remedial alternatives at Site 4 was estimated at $1,983,000 in the ROD. This estimate included costs associated with site preparation, site grading, cover system placement, and security fencing. The actual final cost for implementation of the RD was approximately $2,000,000. An exact cost break down is not readily available because this remedial action was implemented concurrently with action at Site 5, and basic mobilization and materials costs were shared.

To meet the institutional control requirements in the ROD, the Navy placed land use restrictions into the base Master Plan to restrict use at IR Site 4 at NWS Earle (DON 2003). The land use restrictions define access limitations precluding actions that could result in ground surface disturbance of soils or any subsurface disturbance that could result in damage to the landfill cap. Implementation of the CEA under NJDEP guidelines ensures that untreated groundwater beneath the site will not be used as a drinking water source.

Other components of the remedial action, including long-term groundwater monitoring and O&M, are discussed in Section 2.3.3.

2.3.3 System Operations/Operation and Maintenance

The Navy implemented a groundwater monitoring program at Site 4 in July 1999. The results of the program are being used to assess the effectiveness of the remedial action. Annual sampling has been completed at the site since the program was initiated in accordance with the final Operations and Maintenance Manual for the Site 4 and Site 5 Landfills (FWENC, 1999). Three rounds of annual sampling have been completed as of July 2002, and three annual reports have been prepared to document the results of the monitoring program. These reports have been submitted to the USEPA and NJDEP for review and comment. The annual reports include an evaluation of the data collected under the program and provide a brief screening-level assessment of the data. The results of the program are discussed in Section 2.4.2.

The average annual O&M costs (including long-term monitoring, mowing, cover and fence repairs, etc.) were estimated at $29,600 per year for 30 years, and five-year reviews were estimated to cost $15,500 per event in the ROD. Costs associated with the annual long-term monitoring and cap maintenance were estimated at $21,600 and $8,000, respectively. The actual annual cost for O&M at Site 4 is approximately $31,000.

2.4 FIVE-YEAR REVIEW FINDINGS

2.4.1 Site Inspection

A site inspection was conducted at Site 4 in January 2003 (and also during annual groundwater sampling). Features inspected during the inspection at Site 4 included general conditions of the cap, warning signs, drainage swale vegetation/sedimentation and fencing status (e.g., if the gates were locked and the fencing was in good repair or if there was evidence of activities/damage on the cap). Weather conditions during the inspection were favorable, with sun, mild temperatures, and no precipitation. A representative from TtNUS performed the inspection. Photographs taken of the site during the site inspection are provided in Appendix A. A site inspection checklist was completed during the inspection. The completed checklist is provided in Appendix B.

The site inspection included visual observations of the current condition of the engineered landfill cap system at Site 4. During the site inspection, the inspector found that the land use for the site has remained unchanged since the remedial action was completed. No evidence of access to the landfill cap for activities other than mowing/maintenance was apparent. Warning signs were also observed during the inspection at the entrances to the site, warning that access is permitted only for authorized users and that personnel should not dig at the site. In general, the site inspection found that the cap system was working as intended. No deficiencies were noted in cap construction or maintenance.

2.4.2 Document and Analytical Data Review

2.4.2.1 Document Review

The documents reviewed for the five-year review are listed below, and key information obtained from the documents is summarized in the following paragraphs.

- RI Report
- FS for Sites 4, 5, 19, and 26
- ROD, OU 1, Sites 4 and 5
- Remedial Design Report for Site 4
- Final Report for Remedial Action at Site 4
- Operations and Maintenance Manual for the Site 4 and Site 5 Landfills
- 2001 Annual Groundwater Sampling of Monitoring Wells Landfill Caps for Sites 4 and 5

A review of the RI, FS, and ROD for Site 4 provided the background for the site, RAOs, ARARs, and a description of the selected remedy for the site. The review also provided the cost estimate for the remedial alternative.

A review of the Revised Design Report for Site 4 provided the details of the design of the engineered cover. The design included the final cap components and a detailed cost estimate for construction of the cap.

A review of the Final Report for Remedial Action at Site 4 provided the details of the cap construction activities and the changes made to the design during construction. The report also summarizes the quality assurance and control testing and inspections that were performed during the construction of the cap.

A review of the Operations and Maintenance Manual for the Site 4 and Site 5 Landfills provided the monitoring well network to be used for the long-term groundwater monitoring program. The plan also detailed the analytical program, monitoring criteria, and data evaluation approach.

A review of the 2001 Annual Groundwater Sampling of Monitoring Wells Landfill Caps for Sites 4 and 5 provided an updated understanding of the site. The results of this groundwater monitoring were compared to historical data and were used as the basis for conclusions and recommendations for potential future actions at the site.

2.4.2.2 Data Review

The Navy implemented a monitoring program at Site 4 in July 1999. The results of the program are being used to assess the effectiveness of the remedial action. A summary of the conclusions and recommendations from the 2001 annual groundwater report is provided below. Table 2-1 summarizes the groundwater analytical data collected during the program. The chemicals provided in the table are the COPCs identified in the RI, FS, and ROD. The criteria used to screen the data are also provided in the table. The primary criteria are the NJDEP Cleanup Standards for Contaminated Sites for groundwater. Figure 2-2 is a tag map showing groundwater data that exceeded applicable criteria.

The data evaluation completed for the 2001 annual report indicated that the majority of samples showed decreased VOC levels in groundwater compared to RI sample results. One sample had a VOC compound (TCE) concentration above the NJDEP criterion of 1.0 ug/L. The TCE concentration in the sample was 15 ug/L, but was lower than the corresponding RI result of 55 ug/L. Two other organic chemicals, 1,2-DCE and vinyl chloride, found at concentrations exceeding regulatory limits in the RI, were detected at concentrations below their respective regulatory criteria.

Some common, naturally occurring inorganic analytes (metals) were detected in the Site 4 monitoring wells above the NJDEP criteria. The metals detected above regulatory criteria included aluminum, iron and manganese, which have been detected at similar concentrations in Site 4 monitoring wells in the past. The aluminum, iron, and manganese are considered naturally occurring and not a result of the landfill operations. The majority of groundwater sample results for inorganic analysis showed a decrease when compared to the data from the RI.

Based on the sample results recorded during the previous sampling events and the approved O&M Manual, both filtered and unfiltered groundwater samples were collected from the monitoring wells at Site 4. The groundwater samples were field filtered in accordance to NJDEP procedures. Filtered versus non-filtered sample results were compared for this round of sampling and previous rounds of sampling. Based on the comparison of filtered versus unfiltered groundwater samples, the inorganic concentrations from the samples collected in 2001 decreased when the groundwater was filtered. Elevated inorganic concentrations are suspected to be the result of suspended particulates in the groundwater samples.

2.4.3 ARAR and Site-Specific Action Level Changes

The remedial action implemented at Site 4 includes O&M of the engineered cap system, institutional controls, and long-term monitoring. ARARs and TBCs were reviewed to determine whether there have been changes since the ROD was signed. The chemical-specific, location-specific, and action-specific ARARs, advisories, and guidance values (TBCs) that have changed are provided in the table below. Changes associated with monitoring are addressed in the response to Question 2 of Section 2.5, Assessment.

Contaminant	ARAR/Site-Specific Level		Source
GROUNDWATER			
1,2-DCE	Previous	10 µg/L	NJDEP Groundwater Quality Standard
	New	100 µg/L	NJDEP Cleanup Standards for Contaminated Sites
Arsenic	Previous	50 µg/L	Primary Drinking Water Standard
	Previous	8 µg/L	NJDEP Groundwater Quality Standard
	New	10 µg/L	Primary Drinking Water Standard

The ERA for Site 4 indicated that contaminants did not appear to be significantly migrating to surface water and sediments in the wetlands via overland runoff and/or groundwater to surface water discharge. The site was subsequently capped, further eliminating that potential exposure pathway. Therefore, changes in the ERA screening values since the completion of the ERA would not impact the effectiveness of the remedial action.

2.5 ASSESSMENT

The following conclusions support the determination that the remedy for Site 4 is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

- ***Health and Safety Plan (HASP)/Contingency Plan:*** An O&M program is being implemented at Site 4. The results of the program are being used to evaluate the cap's performance regarding minimizing contaminant migration. The data indicate there are no significant contaminant migration concerns. Should groundwater data indicate the need to evaluate additional remedial actions at some point in the future the Navy can perform the evaluation at that time.

- ***Implementation of Institutional Controls and Other Measures:*** Institutional controls associated with Site 4 are being implemented in accordance with the Master Plan for Site 4 (DOD 2003). Fencing is in place around the site, and signs are posted at the entrances of Site 4 that warn access is only for authorized users, a cap is in place, and no digging is allowed. These controls meet the intent of the institutional controls RAO discussed in Section 2.3.1. At the time of the site inspection, the fencing was found in good repair as were the warning signs. The gates appeared to be locked at all times except for routine maintenance activities and there was no evidence of unauthorized access.

- ***Remedial Action Performance:*** An engineered landfill cap system was installed at Site 4. This cap is currently effective in limiting direct exposure to contaminated soil and minimizing contaminant migration from the site. The CEA in effect at the site has had the desired effect of precluding groundwater use from the area while the Navy and regulators monitor progress toward natural contamination reduction. A long-term monitoring program is being implemented to evaluate the cap's performance regarding minimizing contaminant migration. It appears that proper O&M is being implemented to maintain long-term performance of the cap system.

- ***System Operations/O&M:*** Installation of the engineered cap system was completed in September 1999. The system is still functioning as intended. It appears that routine O&M has been performed and has been effective in maintaining the features of the cap in good condition.

- ***Cost of Operations/O&M:*** Actual annual costs for the current groundwater monitoring program and annual O&M costs for the cap system are approximately $31,000.

- ***Opportunities for Optimization:*** The frequency of sampling for the long-term monitoring program has been annual and may be able to be reduced to every 2 years. The analytical parameter list for the groundwater monitoring program currently includes the VOC and metals list and may be able to be reduced to the COPCs (TCE, 1,2-DCE, VC, specific metals, etc.). Changes in the monitoring program should be considered at the end of the fifth year of the annual monitoring program.

- ***Early Indicators of Potential Remedy Failure:*** No deficiencies were noted in the O&M of the cap system.

Question 2. Are the assumptions used at the time of the remedy selection still valid?

- ***Changes in Standards and TBCs***: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the ROD was signed. As presented in Section 2.4.3, there have been minor changes to currently relevant ARARs. Changes in the Primary Drinking Water Standards and the NJDEP Cleanup Standards for Contaminated Sites do not impact the protectiveness of the remedy.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** There have been no changes in the human health toxicity criteria that will impact the primary or secondary monitoring criteria. Changes in toxicity factors have occurred for chloroform and VC (cancer slope decrease); TCE (cancer slope increase); and manganese (RfD increase). Using the latest monitoring event data, the resulting lifetime resident cancer risk is still approximately equal to the RI of 1×10^{-4}, the upper end of the acceptable risk range. Risk estimated using the most recent data is primarily attributable to TCE, which was detected at a lower concentration than the maximum concentration in the RI, while VC (the primary contributor in the RI) was not detected in the latest monitoring event. HIs for future residential exposure by groundwater still exceeded 1.0, primarily due to iron. The latest sample results show that VOCs (1,2-DCE and VC) and several metals (aluminum, iron, manganese) still exceed applicable groundwater standards.

- ***Changes in Risk Assessment Methodologies:*** As discussed in Section 1.4, there have been no major changes in HHRA or ERA methodology since the signing of the ROD.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No information has been identified that would call into question the protectiveness of the remedy.

2.6 DEFICIENCIES

No major deficiencies were identified during the five-year review of the site.

2.7 RECOMMENDATIONS AND REQUIRED ACTIONS

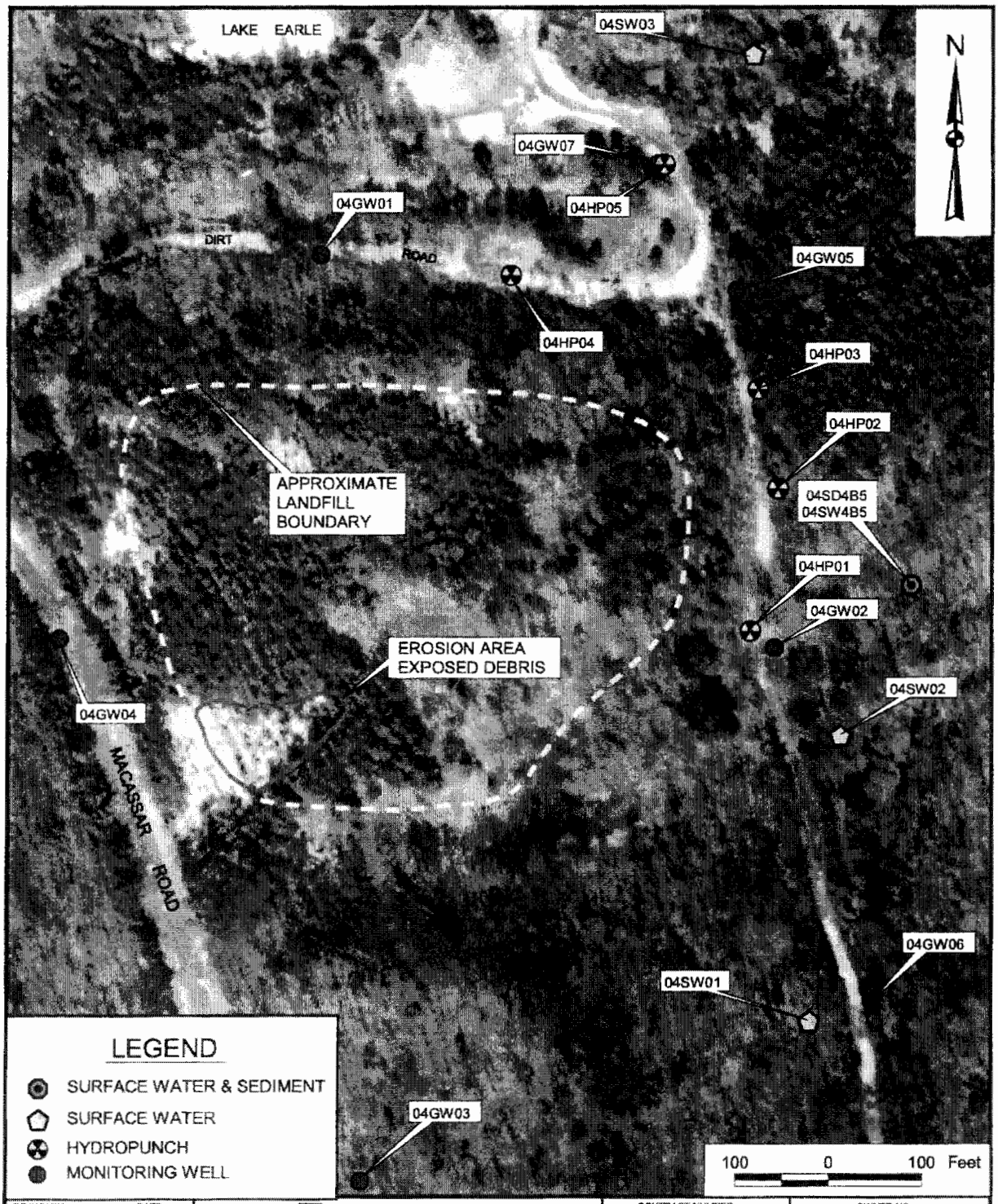
Based on the results of the site inspection and review, the following recommendations and actions are required for Site 4:

- Continue to conduct the long-term monitoring in accordance with the O&M Manual.
- Consider reducing the sampling frequency to 2 year intervals (collect samples in 2005 and 2007).
- Reduce the analytical parameter list to specific VOCs - TCE, 1,2-DCE and VC and metals – aluminum, iron and manganese.
- Continue restricting access to the site.
- Continue enforcement of access restrictions in the Base Master Plan.

2.8 PROTECTIVENESS STATEMENT

The remedy at Site 4 is currently protective of human health and the environment. The source of contamination is contained. The engineered cap system minimizes infiltration and subsequent contaminant migration and prevents direct contact with soil and contaminated landfill materials. A long-term monitoring program is being implemented to verify that the cap is performing as designed. The results of the monitoring program suggest that the cap is performing as planned. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The institutional controls, through the CEA, place restrictions on use of site groundwater.

The Navy and USEPA along with the NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 4. Based on the completed activities and the activities that are underway or planned, the intent and goals of the ROD for Site 4 have been met.



DRAWN BY: LDL	DATE: 1/28/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER NO.: FIVE-YEAR REVIEW
CHECKED BY: RFD	DATE: 2/6/03	SITE PLAN OPERABLE UNIT 1, SITE 4 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle_5YearReview.apr LAYOUT: FIVE-YEAR REVIEW-SITE 4
COST/SCHEDULE-AREA			APPROVED BY: RET / DATE: 2/26/03
SCALE: AS NOTED			DRAWING NO.: FIGURE 2-1 / REV

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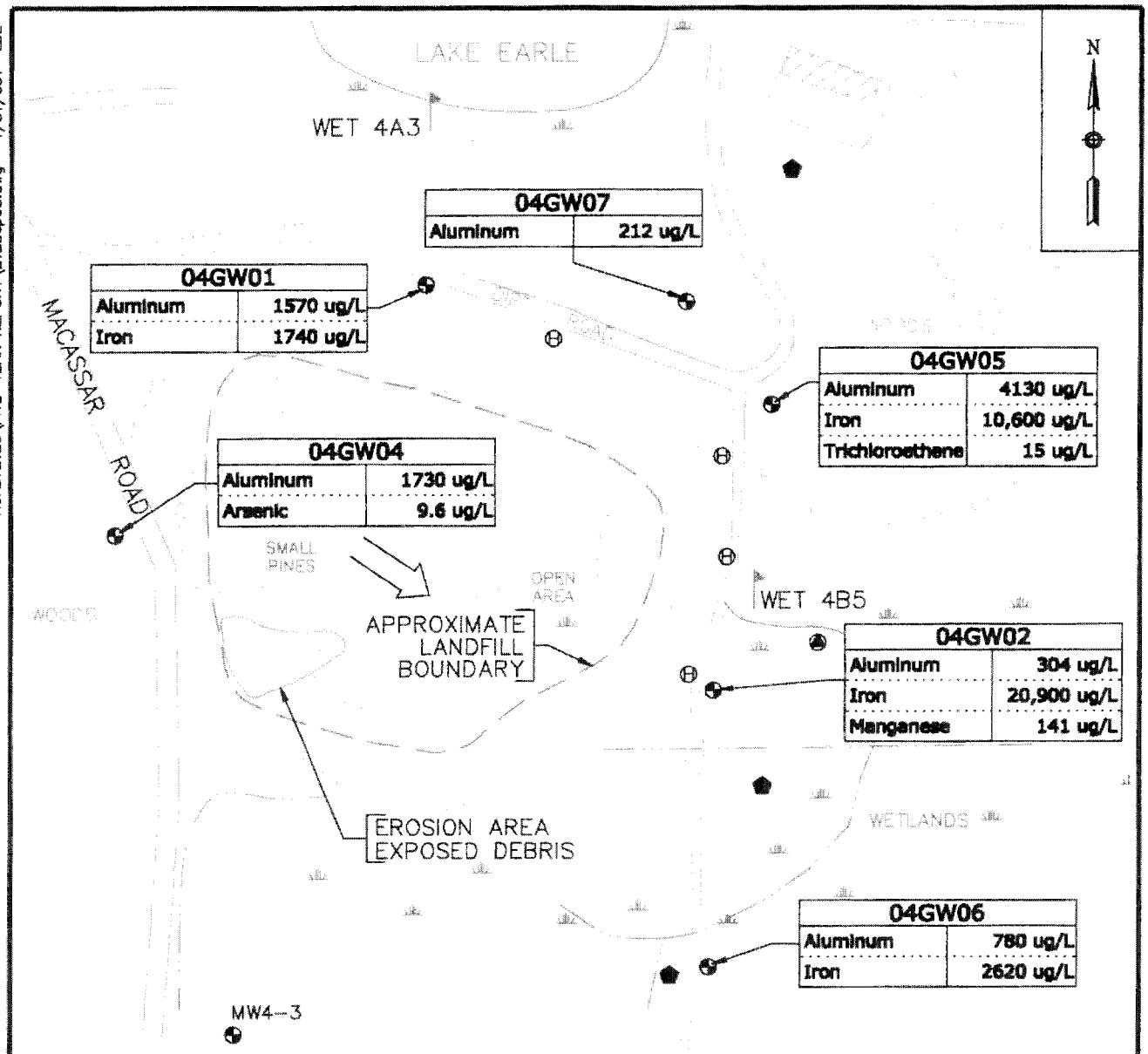


LEGEND

- MONITORING WELL LOCATION
- WETLANDS SAMPLE LOCATION
- SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- SURFACE WATER SAMPLE LOCATION
- GROUNDWATER FLOW DIRECTION
- HYDROPUNCH SAMPLE LOCATION
- WETLANDS
- APPROXIMATE DRAINAGE
- APPROXIMATE LANDFILL BOUNDARY

TETRA TECH NUS, INC.

GROUNDWATER CONCENTRATIONS ABOVE REGULATORY CRITERIA

OPERABLE UNIT 1, SITE 4

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE:	2128cp03.dwg LDL PHL
REV	DATE 2/4/03
FIGURE NUMBER	FIGURE 2-2

TABLE 2-1

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER
OPERABLE UNIT 1, SITE 4
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemical of Potential Concern	Remedial Investigation		Latest Long-Term Monitoring Event[2]	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection[1]	Maximum Concentration	USEPA/NJDEP
ORGANICS (µg/L)						
Chloroform	1/6	1	ND		ND	100/6
1,2-Dichloroethene	2/6	25	5.4		ND	70/10
Trichloroethene	2/6	55	15		ND	5/1
Vinyl Chloride	1/6	3	ND		ND	2/5
INORGANICS (µg/L)						
Aluminum	6/6	2690	4130	11/11	7870	NS/200
Barium	6/6	961	20.1	11/11	518	2000/2000
Beryllium	2/6	1.6	ND	4/11	1.6	4/20
Cadmium	4/6	0.84	ND	5/11	1.9	5/4
Copper	6/6	18.3	11.1	9/11	13.5	1300/1000
Iron	6/6	20900	20900	11/11	7690	NS/300
Lead	3/6	3	3.4	3/11	3	15/10
Manganese	6/6	306	141	11/11	65	NS/50
Zinc	5/6	558	64.5	6/9	348	NS/5000

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] October 24, 2001.

[3] USEPA Maximum Contaminant Level/NJDEP Ground Water Quality Standards N.J.A.C. 7:9-6.

Shading indicates that the value is greater than regulatory criteria.

NS = No standard.

ND -= Not Detected.

3.0 OPERABLE UNIT 1, SITE 5 – LANDFILL WEST OF ARMY BARRICADES

Site 5 under the Navy's IRP includes the Landfill West of the Army Barricades. The landfill is a 13-acre site used to dispose of domestic and industrial wastes from 1968 to 1978. This five-year review of Site 5 is required by statute because hazardous substances, pollutants, or contaminants remain on site at concentrations that do not allow for unlimited use or unrestricted exposure. An interim remedial action for Site 5 was completed in September 1995, and the RD and remedial action were completed in 1997 and 1999, respectively. The site has been monitored since the remedial action was completed to assess the effectiveness of the remedial action. Data collected during the monitoring program are evaluated within this report.

3.1 HISTORY AND SITE CHRONOLOGY

A list of important Site 5 historical events and relevant dates in the site chronology is shown below. The identified events are illustrative, not comprehensive.

Event	Date
Landfill operations.	1968 to 1978
Final IAS completed.	1982
Phase I Site Inspection/IRP Phase II Confirmation Study completed.	1986
Phase II Site Inspection completed.	1993
Interim Remedial Action to stabilize the site completed.	1995
RI completed.	1996
FS completed.	1997
PP issued.	March 1997
Public Meeting.	April 1997
ROD signed.	September 1997
RD completed.	November 1997
Remedial Action began.	February 1998
Remedial Action completed	September 1999
Final Report for Remedial Action issued.	May 25, 1999
Final Operations and Maintenance Manual for the Site 4 and Site 5 Landfills issued.	March 1999
Groundwater Monitoring Program initiated.	July 1999
Annual Groundwater Monitoring Program.	Ongoing

3.2 BACKGROUND

Site 5 is a 13-acre landfill that received approximately 6,600 tons of mixed domestic and industrial wastes from 1968 until 1978 (Figure 3-1). Materials disposed include paper, glass, plastic, wood, pesticide containers, pesticide, rinse water, and discarded containers of paint, paint thinner, solvent, varnishes, shellacs, acids, alcohols, caustics, and asbestos. The landfilled materials were covered by loose sand from the surrounding area. The landfill cover ranges in depth from 1 to 3 feet. Approximately 1 acre of the site was used as a skeet shooting range.

Site 5 was an open area, moderately vegetated with grasses and scrub pines, and surrounded by woodlands. The site is located approximately 1,000 feet southwest of Site 2 (the Active Ordnance Demilitarization Site) and was accessible by a dirt road along the northwestern border. Railroad tracks run along the southwestern boundary, and a wetland is located to the west between the landfill cap and the railroad tracks. Before the cap was installed, the topography of the site was flat, inhibiting off-site runoff; therefore, precipitation perched on the site and infiltrated. Topography across the site sloped gently to the southwest from approximately 115 feet to 105 feet above msl. Groundwater flow is generally to the northeast (at a slight gradient), based on measured groundwater levels.

Regional geologic mapping identifies Site 5 as being within the outcrop area of the Kirkwood Formation, which ranges between 60 and 100 feet in thickness. The lithology of the soils encountered in the on-site borings generally agrees with the published descriptions of the Kirkwood and Vincentown Formations. The on-site borings were no greater than 55 feet deep. Assuming a portion of the Kirkwood Formation was removed by erosion, it is possible that at least one of the soil borings penetrated the underlying Vincentown Formation. In general, the borings encountered brown and gray, very fine- to medium-grained sand and dark-colored silt (probably representative of the Kirkwood Formation) and olive and olive brown, slightly glauconitic, fine- to coarse-grained sand (probably representative of the Vincentown Formation).

Based on the boring log descriptions, well MW5-06 penetrated the Kirkwood Formation, wells MW5-02, MW5-03, MW5-05, MW5-07, and MW5-08 penetrated both the Kirkwood and Vincentown Formations, and wells MW5-01 and MW5-4 penetrated the Vincentown Formation.

Groundwater in the Kirkwood and Vincentown aquifer beneath the site occurs under unconfined conditions, and the formations are interpreted to be hydraulically interconnected. The direction of shallow groundwater flow in the aquifer is northeast. There does not appear to be a significant seasonal variation in groundwater flow direction. The hydraulic conductivity values calculated for MW5-02 (Kirkwood and Vincentown Formation), MW5-06 (Kirkwood Formation), and MW5-07 (Vincentown Formation) are 3.18×10^{-4} cm/sec (0.90 ft/day), 6.46×10^{-4} cm/sec (1.83 ft/day), and 2.08×10^{-4} cm/sec (0.59 ft/day), respectively from the RI.

The IAS and Site Investigation concluded that a potential threat to groundwater existed at the site. The results of the Phase II Site Investigation showed metals and VOCs in subsurface soil and groundwater samples. Four test pits were excavated during the Phase II Site Inspection to characterize the wastes disposed at the landfill. A layer of trash, ranging in thickness from 6 to 13 feet, was encountered in the four test pits. The trash consisted of foam rubber, glass, paper, plastic, metal scrap materials, lumber, concrete, bricks, and other construction debris.

The RI indicated the presence of VOCs [1,2-dichloroethane (1,2-DCA), 1,2-DCE, TCE, benzene, ethylbenzene, xylene, VC] and metals (e.g., aluminum, arsenic, cadmium, cobalt, iron, manganese, nickel and thallium) in groundwater samples, generally confirming previous findings. Figure 3-1 depicts the sample locations. Table 3-1 summarizes the results of samples obtained from the groundwater monitoring wells during the RI (historical perspective) and long-term monitoring (current conditions) and compares them to applicable standards.

During the RI, organic compounds found in groundwater at concentrations above regulatory standards included 1,2-DCA, benzene, chloroform, and TCE. The four compounds were found at concentrations less than the federal standard for human consumption for potable water supplies, but slightly above the NJDEP standard. 1,2-DCA, TCE, and benzene were each found in two monitoring wells downgradient of the landfill. Chloroform was found in one monitoring well upgradient of the landfill at a concentration above the NJDEP standard.

During the RI, metals found in groundwater at concentrations greater than regulatory guidelines included aluminum, cadmium, iron, manganese, nickel, and thallium. In the case of Site 5, of eight monitoring well samples collected, four met the sample collection endpoint turbidity goal, and the other four had relatively low endpoint turbidity values, indicating no probable general correlation between turbidity and groundwater samples metals concentrations above regulatory standards or background. The metals aluminum, cadmium, cobalt, chromium, iron, manganese and nickel were found in groundwater at concentrations generally 1 to 1.5 times the corresponding background concentrations. Aluminum in one monitoring well was found at a concentration approximately six times the highest concentration found in a background groundwater sample. Beryllium was detected at a concentration greater than background but near the instrument detection limit in one monitoring well, and thallium was found in two upgradient well samples at low concentrations although it was not found in background samples.

Computer modeling estimated that Site 5 groundwater metal concentrations would gradually diminish over a long period of time assuming a source control measure such as capping would be implemented to control vertical migration. The model estimated that metals concentration at the nearest potential

discharge point, a stream located approximately 3,500 feet downgradient of Site 5, would be significantly less than either State standards or background concentrations.

In summary, results of investigations at Site 5 indicated that:

- Source control (e.g., covering the landfill) would inhibit infiltration of water through the landfill, preclude the leaching of additional volatiles and metals, and promote natural attenuation. Long-term monitoring would be required to evaluate the effectiveness of source control.

- The low concentrations of 1,2-DCA and TCE found in groundwater downgradient of the landfill were indicative of contaminants leaching from a limited source area that were degrading with time and were not wide spread.

- The low concentration of chloroform found in one upgradient monitoring well did not appear to be the result of a concentrated source in the area of the landfill.

- Metals concentrations in groundwater were found to be slightly greater than background or the corresponding NJDEP standard (generally at 1 or 1.5 times the corresponding background concentration).

- Modeling estimated that metals in groundwater will migrate only very little, and concentrations will diminish slowly with time.

- Thallium found at low concentrations in groundwater upgradient of the landfill does not appear to be leaching from the landfill.

After significant investigation over more than a decade, no concentrated source of VOCs was found at Site 5. It is unlikely that a concentrated source of VOC contamination exists in the landfilled material.

The HHRA concluded that the cancer risk associated with future residential exposure from groundwater at Site 5 was approximately 1.3×10^{-4}, the upper end of the acceptable risk range. This value is primarily due to arsenic and VC detected in groundwater samples (although both were only detected in one well at levels at or below USEPA and New Jersey standards). In addition, the noncarcinogenic HI also exceeded the acceptable risk level of 1.0 due to iron.

Contaminants detected in Site 5 groundwater samples that exceeded standards included 1,2-DCA, benzene, chloroform, TCE, aluminum, cadmium, iron, manganese, nickel, and thallium.

The ERA concluded that contaminants do not appear to be significantly migrating to surface water and sediments in the wetlands via overland runoff and/or groundwater to surface water discharge at a level of ecological concern. Significant contaminant inputs from future discharge are unlikely because the landfill has been inactive since 1978 and the effect of discharge would most likely have already occurred.

3.3 REMEDIAL ACTIONS

Based on the results of the RI/FS process, it was determined that a remedial action was necessary for Site 5. A ROD for Site 5 was signed in September 1997 (DON, 1997a). The following sections describe the process used to select and implement the appropriate remedial action for Site 5.

3.3.1 Remedy Selection

An FS for Site 5 (B&RE, 1997a) was completed in response to the recommendations of the RI. The FS evaluated several remedial alternatives. In the case of former landfill sites like Site 5, USEPA has undertaken the presumptive remedies initiative to speed up selection of remedial actions. Based on the expectation that containment would generally be appropriate for municipal landfill waste (such as that found at Site 5) and because the volume and heterogeneity of the waste generally make treatment impracticable, USEPA established containment as the presumptive remedy. Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soils, sediments, or groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail.

The FS concluded that capping, institutional controls, and long-term monitoring should be the preferred remedial alternative. The Navy, with the support of USEPA and in consultation with NJDEP has selected this alternative, presented it in the PP in March 1997, and formally selected it in the ROD signed in September 1997. This alternative is in compliance with the USEPA presumptive remedy and includes a CEA as required by the State groundwater quality protection criteria. The CEA covers the area immediately adjacent and downgradient of the landfill. Capping the landfill inhibits infiltration of groundwater through the landfill thus, in time, eliminating the groundwater contamination source. This alternative mitigates the potential exposure scenarios of direct exposure to landfill contents and consumption of contaminated groundwater from site and is protective of human health and the environment.

Based on ARARs and risk assessment results, the following RAOs were selected for Site 5:

- Prevent potential human exposure to contaminated landfill soil and materials underlying the skeet and shooting range.
- Minimize migration of landfill contaminants to groundwater and restore the aquifer to the applicable standard.

The remedy selected for Site 5 meets the RAOs. The selected remedy is a containment option, as defined in the ROD, consisting of the following components:

- Institutional Controls - Institutional controls were enacted to limit future uses of the site that may result in disturbance of the soil cover or direct contact with contaminated media and to prohibit use of untreated contaminated groundwater. The institutional controls prevent potential human exposure to contaminated soils and landfilled materials. The institutional controls provide notice of hazardous materials at the site and ensure maintenance of cap integrity, worker protection, and other considerations. Fencing and access restrictions provide additional long-term protection by limiting access to the capped area and restricting activities that could damage or intrude into the cover system and contaminated media. Because site groundwater does not meet New Jersey groundwater quality standards, a CEA pursuant to N.J.A.C. 7:9-6 was established to provide the State official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area (immediately adjacent to the landfill) is suspended until standards are achieved.

- Landfill Cover System (Capping) – A low-permeability cover system that complies with federal and State regulatory requirements, prevents potential human and animal contact with contaminants in landfill materials, limits contaminant leaching to groundwater, and minimizes contaminant migration via surface runoff and erosion was installed. The Navy maintains the cap.

- Groundwater Monitoring – Long-term, periodic monitoring is being conducted to assess contaminant status and potential threats to human health and the environment. The long-term, periodic monitoring program allows the Navy and regulatory agencies to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. Site conditions and risks are reviewed every 5 years because wastes have been left in place. Over time, the contaminants in groundwater will likely attenuate naturally through chemical and biological degradation (VOCs only) and physical processes (metals and VOCs). Metals concentrations in groundwater may decrease as a result of reduced infiltration of precipitation through landfill materials.

By regrading the landfill surface to preclude erosion, placing a cap over the landfill surface to avoid potential direct contact with landfill contents, and establishing a formal CEA to bar the use of site groundwater during the remediation period, the Navy has reduced the unacceptable risks associated with Site 5. While the RAO for groundwater protection was not immediately achieved, risks have been reduced in relation to background by the elimination of infiltration and continued monitoring to evaluate contaminant trends. Long-term, periodic monitoring and analysis helps determine when this RAO will be achieved.

The remedy selected for Site 5 satisfied the remedy selection requirements of CERCLA and the NCP. Based on available information, the Navy believes the remedy is protective of human health and the environment, complies with ARARs (statutory requirements of USEPA, the State, and the local community), and is cost-effective.

3.3.2 Remedy Implementation

The RD for Site 5 began in August 1997 and was completed for the Navy by B&RE in November 1997 (1997b). Additional field work consisting of survey, geotechnical field investigation, and geotechnical laboratory testing was conducted to finalize construction details at the time of landfill cap construction.

Minor modifications were made to the cover system design as a result of normal refinement of details during the implementation. The components of the final cover system from top to bottom were:

- Top Layer - protects the cover from erosion by rain or wind and from burrowing animals and vegetated with permanent plant species such as grasses and legumes.

- Drainage Layer - prevents accumulation of water above the infiltration layer that could damage the geosynthetic clay or cause erosion of the top layer.

- Barrier Layer - minimizes precipitation infiltration into the landfill materials and, in accordance with applicable regulations and guidance, consisting of a geosynthetic clay layer with a maximum permeability of 1×10^{-7} cm/s,.

- Gas Collection Layer – provides a gas-permeable avenue through vents in the geosynthetic clay membrane to vent potential landfill gas.

- Subgrade - provides a well-compacted and smooth surface of sufficient thickness to prevent puncture of the barrier layer by landfill materials.

The Navy's RAC mobilized to the site to begin preliminary construction activities in February 1998, and the remedial action was completed in September 1999. Details regarding the remedial action are summarized in the Final Report for the Closure of Sites 4 and 5 (FWENC, 1999). The most significant change to the RD that occurred during the remedial action was the inclusion of soil material under the cap that was excavated from Site 5. This change resulted in a 2.8-foot elevation increase in one area of the landfill that necessitated modifications to the cover system installed along the slopes of three drainage channels.

To make sure of the quality of the remedial action, quality control testing and inspection were completed during the remedial action in accordance with the Construction Quality Control (CQC) Plan and the Material Quality Assurance (MQA) /Construction Quality Assurance (CQA) Plan. Two non-conformances were noted during quality control testing and inspection, but neither was regarded as significant enough to affect the performance of the cap system.

The capital cost for implementation of the preferred remedial alternative was estimated at $588,000 in the ROD. This estimate included costs associated with site preparation, site grading, and vegetative soil cover system. A revised estimate was prepared during the RD that included a more protective RCRA-type cap and closure of an existing skeet range at the site. The actual final cost for implementation of the RD was approximately $3,500,000.

To meet the institutional control requirements in the ROD, the Navy placed land use restrictions into the base Master Plan to restrict use at IR Site 5 at NWS Earle (DON 2003). The land use restrictions define access limitations precluding actions that could result in ground surface disturbance of soils or any subsurface disturbance that could result in damage to the landfill cap. Implementation of the CEA under NJDEP guidelines ensures that untreated groundwater beneath the site will not be used as a drinking water source.

Other components of the remedial action, including long-term groundwater monitoring and O&M, are discussed in Section 3.3.3.

3.3.3 System Operations/Operations and Maintenance

The Navy implemented a groundwater monitoring program at Site 5 in July 1999. The results of the program are being used to assess the effectiveness of the remedial action. Annual sampling has been completed at the site since the program was initiated in accordance with the final Operations and Maintenance Manual for the Site 4 and Site 5 Landfills (FWENC, 1999). Three rounds of annual sampling have been completed as of July 2002 and three annual reports have been prepared to document the results of the monitoring program. These reports have been submitted to the USEPA and

NJDEP for review and comment. The annual reports include an evaluation of the data collected under the program and provide a brief screening-level assessment of the data. The results of the program are discussed in Section 3.4.2.

The average annual O&M costs (includes long-term monitoring, mowing, cover and fence repairs, etc.) are estimated at $18,600 per year for 30 years, and five-year reviews were estimated at $15,500 per event in the ROD. Costs associated with the annual long-term monitoring and cap maintenance were estimated at $15,800 and $2,800, respectively. The actual cost for the annual O&M at Site 5 is approximately $31,000.

3.4 FIVE-YEAR REVIEW FINDINGS

3.4.1 Site Inspection

A site inspection was conducted at Site 5 in January 2003 (and also during annual groundwater sampling). Features inspected during the inspection at Site 5 included general conditions of the cap, warning signs, drainage swale vegetation/sedimentation and fencing status (e.g., if the gates were locked and the fencing was in good repair or if there was evidence of activities/damage on the cap). Weather conditions during the inspection were favorable, with sun, mild temperatures, and no precipitation. A representative from TtNUS performed the inspection. Photographs taken of the site during the inspection are provided in Appendix A. A site inspection checklist was completed during the inspection. The completed checklist is provided in Appendix B.

The site inspection included visual observations of the current condition of the engineered landfill cap system at Site 5. During the site inspection, the inspector found that the land use for the site has remained unchanged since the remedial action was completed. No evidence of access to the landfill cap for activities other than mowing/maintenance was apparent. Warning signs were also observed during the inspection at the entrances to the site, warning that access is permitted only for authorized users and that personnel should not dig at the site. In general, the site inspection found that the cap system was working as intended. No deficiencies were noted in cap construction or maintenance.

3.4.2 Document and Analytical Data Review

3.4.2.1 Document Review

The documents reviewed for the five-year review are listed below, and key information obtained from the documents is summarized in the following paragraphs.

- RI Report
- FS for Sites 4, 5, 19, and 26
- ROD, OU 1, Sites 4 and 5
- Remedial Design Report for Site 5
- Final Report for Remedial Action at Site 5
- Operations and Maintenance Manual for the Site 4 and Site 5 Landfills
- 2001 Annual Groundwater Sampling of Monitoring Wells Landfill Caps for Sites 4 and 5

A review of the RI, FS, and ROD for Site 5 provided the background for the site, RAOs, ARARs, and a description of the selected remedy for the site. The review also provided the cost estimate for the remedial alternative.

A review of the Remedial Design Report for Site 5 provided the details of the design of the engineered cover. The design included the final cap components and detailed cost estimate for construction of the cap.

A review of the Final Report for Remedial Action at Site 5 provided the details of the cap construction activities and the changes made to the design during construction. The report also summarized the quality assurance and control testing and inspections that were performed during the construction of the cap.

A review of the Operations and Maintenance Manual for the Site 4 and Site 5 Landfills provided the monitoring well network to be used for the long-term groundwater monitoring program. The plan also detailed the analytical program, monitoring criteria, and data evaluation approach.

A review of the 2001 Annual Groundwater Sampling of Monitoring Wells Landfill Caps for Sites 4 and 5 provided an updated understanding of the site. The results of this groundwater monitoring were compared to historical data and were used as the basis for conclusions and recommendations for potential future actions at the site.

3.4.2.2 Data Review

The Navy implemented a monitoring program at Site 5 in July 1999. The results of the program are being used to assess the effectiveness of the remedial action. A summary of the conclusions and recommendations from the 2001 annual groundwater report is provided below. Table 3-1 summarizes the groundwater analytical data collected during the program. The chemicals provided in the table are the COPCs identified in the RI, FS, and ROD. The criteria used to screen the data are also provided in the table. The primary criteria are the NJDEP Cleanup Standards for Contaminated Sites for groundwater. Figure 3-2 is a tag map showing groundwater data that exceeded applicable criteria.

The data evaluation completed for the 2001 annual report indicated that all samples showed decreased organic compound (VOC) levels detected in the groundwater when compared to RI sample results. No sample had a VOC concentration above regulatory criteria, compared to five VOCs exceeding the corresponding regulatory criteria in the 1995 RI.

Some common, naturally occurring inorganic analytes (metals) were detected in the Site 5 monitoring wells above the NJDEP criteria. The metals detected above regulatory criteria included aluminum, iron, manganese, and thallium, which have been detected at similar concentrations in Site 5 monitoring wells in the past. The aluminum, iron, and manganese are considered naturally occurring and not a result of the landfill operations. The majority of groundwater sample results for inorganic analysis showed a decrease when compared to the data from the RI sampling event

Based on the sample results recorded during the previous sampling events and the approved O&M Manual, both filtered and unfiltered groundwater samples were collected from the monitoring wells at Site 5. The groundwater samples were field filtered in accordance to NJDEP procedures. Filtered versus non-filtered sample results were compared for this round of sampling and previous rounds of sampling. Based on the comparison of filtered versus unfiltered groundwater samples, the inorganic concentrations from the samples collected in 2001 decreased when the groundwater was filtered. Elevated inorganic concentrations are suspected to be the result of suspended particulates in the groundwater samples.

3.4.3 ARAR and Site-Specific Action Level Changes

The remedial action implemented at Site 5 includes an engineered cap system, institutional controls, long-term monitoring, and O&M. ARARs and TBCs were reviewed to determine whether there have been changes since the ROD was signed. The chemical-specific, location-specific, and action-specific ARARs, advisories, and guidance values (TBCs) that have changed are provided in the table below. Changes associated with monitoring are addressed in the response to Question 2 of Section 3.5, Assessment.

Contaminant	ARAR/Site-Specific Level		Source
GROUNDWATER			
1,2-DCE	Previous	10 µg/L	NJDEP Groundwater Quality Standard
	New	100 µg/L	NJDEP Cleanup Standards for Contaminated Sites
Arsenic	Previous	50 µg/L	Primary Drinking Water Standard
	Previous	8 µg/L	NJDEP Groundwater Quality Standard
	New	10 µg/L	Primary Drinking Water Standard

The ERA for Site 5 indicated that off-site migration of contaminants to the surrounding wetland areas, upland areas, and Hockhockson Brook or Pine Brook watersheds via overland runoff and/or groundwater to surface water discharge is limited. In addition, the presence of cover material at the landfill and the fact that the extensive vegetation on the site did not appear to be adversely impacted indicated that the potential for adverse ecological effects was low. The site was subsequently capped, further eliminating that exposure pathway. Therefore, changes in the screening values since the completion of the ERA would not impact the effectiveness of the remedial action.

3.5 ASSESSMENT

The following conclusions support the determination that the remedy for Site 5 is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

- ***HASP/Contingency Plan:*** An O&M program is being implemented at Site 5. The results of the program are being used to evaluate the cap's performance regarding minimizing contaminant migration. The data do not indicate any significant contaminant migration concerns. Should groundwater data indicate the need to evaluate additional remedial actions at some point in the future, the Navy will perform the evaluation at that time.

- ***Implementation of Institutional Controls and Other Measures:*** Institutional controls associated with Site 5 are being implemented in accordance with the Master Plan for Site 5. Fencing is in place around the site, and signs are posted at the entrances of Site 5 that warn access is only for authorized users, a cap is in place, and no digging is allowed. These controls meet the intent of the institutional controls RAO discussed in Section 3.3.1. At the time of the site inspection, the fencing was found in good repair as were the warning signs. The gates appeared to be locked at all times except for routine maintenance activities, and there was no evidence of unauthorized access.

- ***Remedial Action Performance:*** An engineered landfill cap system was installed at Site 5. This cap is currently effective in limiting direct exposure to contaminated soil and minimizing contaminant migration from the site. The CEA in effect at the site has had the desired effect of precluding groundwater use from the area while the Navy and regulators monitor progress toward natural contamination reduction. A long-term monitoring program is being implemented to evaluate the cap's performance regarding minimizing contaminant migration. It appears that proper O&M is being implemented to maintain long-term performance of the cap system.

- ***System Operations/O&M:*** Installation of the engineered cap system was completed in September 1999. The system is still functioning as intended. It appears that routine O&M has been performed and has been effective in maintaining the features of the cap in good condition.

- ***Cost of Operations/O&M:*** Actual annual costs for the current groundwater monitoring program and annual O&M costs for the cap system are approximately $31,000.

- ***Opportunities for Optimization:*** The frequency of sampling for the long-term monitoring program has been annual and may be able to be reduced to every 2 years. The analytical parameter list for the groundwater monitoring program currently includes the VOC list and metals and may be able to be reduced to the COPCs (TCE, 1,2-DCA, VC, benzene, chloroform, specific metals, etc.). Changes in the monitoring program should be considered at the end of the fifth year of the annual monitoring program.

- ***Early Indicators of Potential Remedy Failure:*** No deficiencies were noted in the O&M of the cap system.

Question 2. Are the assumptions used at the time of the remedy selection still valid?

- ***Changes in Standards and TBCs***: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the ROD was signed. As presented in Section 3.4.3, there have been minor changes to currently relevant ARARs. The changes in the Primary Drinking Water Standards and the NJDEP Cleanup Standards for Contaminated Sites do not impact the protectiveness of the remedy.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** There have been no changes in the human health toxicity criteria that will impact the primary or secondary monitoring criteria. Changes in toxicity factors have occurred for chloroform and VC (cancer slope decrease); benzene and TCE (cancer slope increase); and manganese (RfD increase). Using the latest monitoring event data, the

resulting lifetime resident cancer risk associated with TCE is 5 X 10^{-6} and benzene is 2 X 10^{-5}, both of which are near the lower end of the acceptable risk range. Both substances were detected at a lower concentration than the maximum concentrations in the RI, which offsets the fact that slope factors increased. HIs for future residential exposure to groundwater are similar to those in the RI, with the change in manganese RfD not significantly changing the HI sum.

The latest sample results show that no VOCs exceed regulatory criteria. Four metals exceed regulatory criteria but are encountered at only slightly increased concentrations compared to the corresponding background concentrations [note that the corresponding background concentration also exceeds the regulatory criterion (see Table 3-1)].

- ***Changes in Risk Assessment Methodologies:*** As discussed in Section 1.4, there have been no major changes in HHRA or ERA methodology since the signing of the ROD.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

3.6 DEFICIENCIES

No major deficiencies were identified during the five-year review of the site.

3.7 RECOMMENDATIONS AND REQUIRED ACTIONS

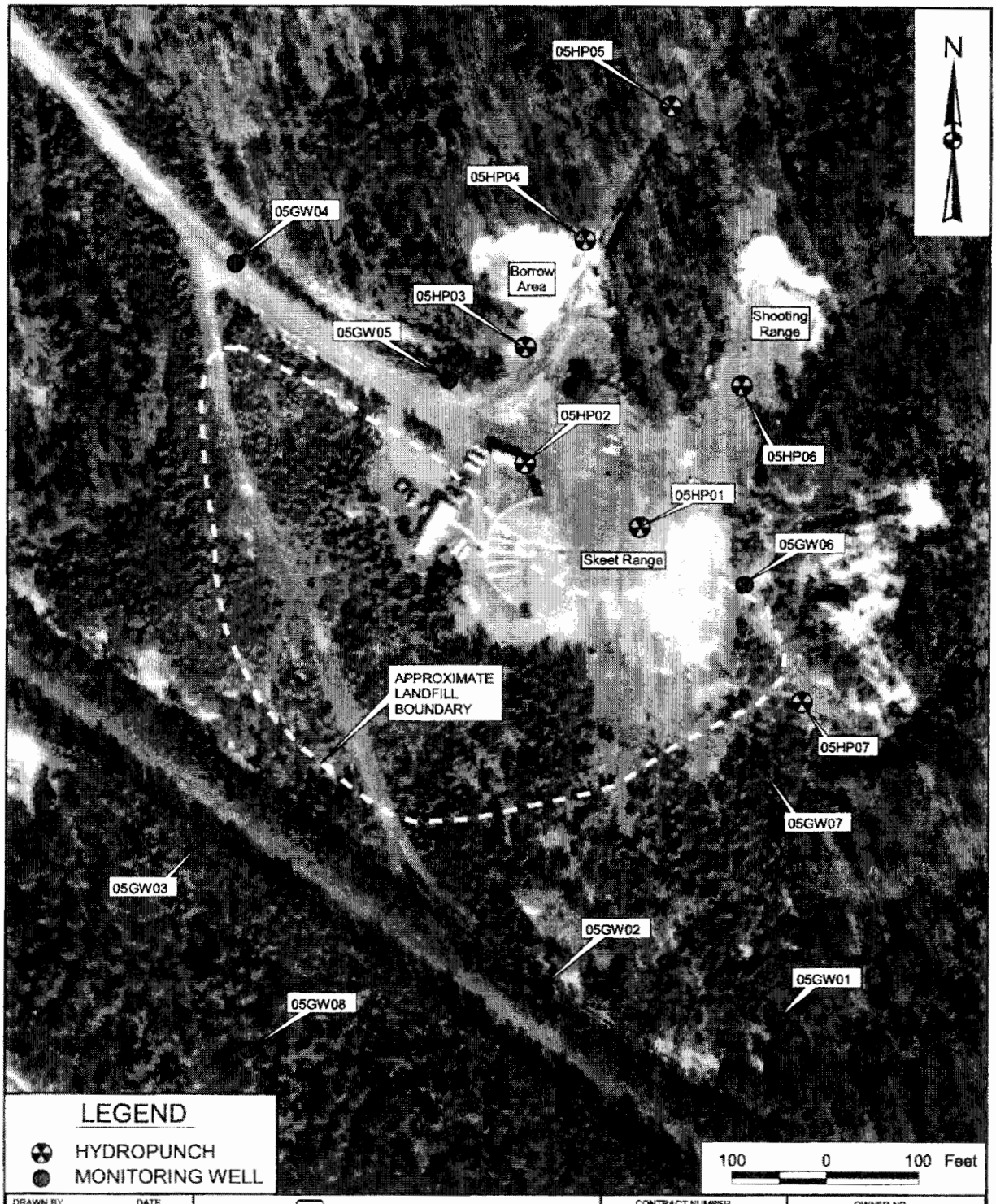
Based on the results of the site inspection and review, the following recommendations and actions are required for Site 5:

- Continue to conduct the long-term monitoring in accordance with the O&M Manual.
- Consider reducing the sampling frequency to 2 year intervals (collect samples in 2005 and 2007).
- Reduce the analytical parameter list to specific VOC's - TCE, 1,2-DCA, VC, benzene, and chloroform and metals. Metals – aluminum, cadmium, iron, mercury, nickel, and thallium.
- Continue enforcement of access restrictions in the Base Master Plan.

3.8 PROTECTIVENESS STATEMENT

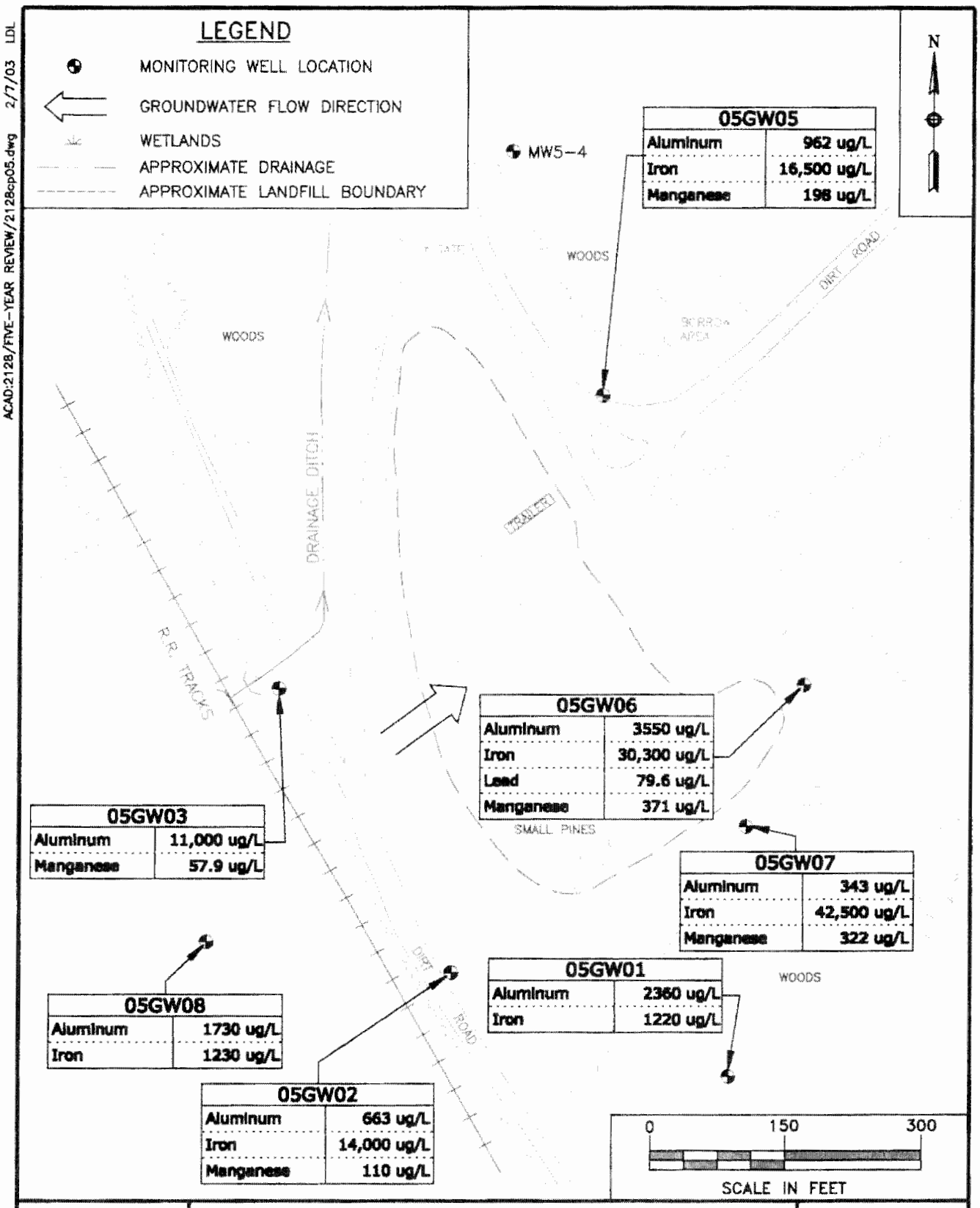
The remedy at Site 5 is currently protective of human health and the environment. The source of contamination is contained. The engineered cap system minimizes infiltration and subsequent contaminant migration and prevents direct contact with soil and contaminated landfill materials. A long-term monitoring program is being implemented to verify that the cap is performing as designed. The results of the monitoring program suggest that the cap is performing as planned. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The institutional controls, through the CEA, place restrictions on use of site groundwater.

The Navy and USEPA along with the NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 5. Based on the completed activities and the activities that are underway or planned, the intent and goals of the ROD for Site 5 have been met.



DRAWN BY: LDL	DATE: 1/28/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER NO: FIVE-YEAR REVIEW
CHECKED BY: RFD	DATE: 2/6/03	SITE PLAN OPERABLE UNIT 1, SITE 5 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle_5YearReview.apr LAYOUT: FIVE-YEAR REVIEW-SITE 5
COST/SCHEDULE-AREA			APPROVED BY: RET / DATE: 2/26/03
SCALE: AS NOTED			DRAWING NO.: FIGURE 3-1 / REV

H:\GIS\GIS_Projects\NWS Earle\5YearReview.apr 1/28/03 LDL [PH]



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TETRA TECH NUS, INC.

GROUNDWATER CONCENTRATIONS ABOVE REGULATORY CRITERIA

OPERABLE UNIT 1, SITE 5

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

SCALE: AS NOTED

FILE: 2128cp05.dwg LDL PHL

REV DATE: 2/18/03

FIGURE NUMBER: FIGURE 3-2

TABLE 3-1

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER
OPERABLE UNIT 1, SITE 5
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Latest Long-Term Monitoring Event[2]	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection[1]	Maximum Concentration	USEPA/NJDEP
ORGANICS (µg/L)						
Benzene	2/8	3	0.9		ND	5/1
Chloroform	1/8	22	ND		ND	100/6
1,2-Dichloroethane	2/8	3	ND		ND	5/2
Trichloroethene	2/8	4	0.7		ND	5/1
Vinyl chloride	1/8	2	ND		ND	2/5
INORGANICS (µg/L)						
Aluminum	8/8	42000	11000	11/11	7870	NS/200
Arsenic	1/8	5.3	6.9	1/11	5.8	10/8
Beryllium	4/8	1.1	0.6	4/11	1.6	4/20
Cadmium	7/8	7.5	3	5/11	1.9	5/4
Copper	5/8	2	35.5	9/11	6.53	1300/1000
Iron	8/8	59200	42500	11/11	7690	NS/300
Manganese	8/8	302	371	11/11	65	NS/50
Mercury	8/8	0.13	ND	11/11	0.12	2/2
Nickel	7/8	102	21.2	10/11	25.5	100/100
Thallium	3/8	5.6	7.8	3/11	5.1	2/10

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] October 23, 2001.

[3] USEPA Maximum Contaminant Level/NJDEP Ground Water Quality Standards N.J.A.C. 7:9-6.

Shading indicates that the value is greater than regulatory criteria.

ND = Not detected.

NS = No Standard.

4.0 OPERABLE UNIT 2, SITE 19 – FORMER PAINT CHIP AND SLUDGE DISPOSAL AREA

Site 19 under the Navy's IRP includes the Former Paint Chip and Sludge Disposal Area. The site was a 300-foot circular area half paved with asphalt and half covered by gravel, used to dispose of paint chips, paint slurries, solvent residues, and sludges from an ordinance maintenance area from the early 1940s until the early 1960s. This five-year review of Site 19 is required by statute because hazardous substances, pollutants, or contaminants remain on site at concentrations that do not allow for unlimited use or unrestricted exposure. The RD and remedial action for Site 19 were completed in 1998 and 2000, respectively. The site has been monitored since the remedial action was completed to assess the effectiveness of the remedial action. Data collected during the monitoring program are evaluated within this report.

4.1 HISTORY AND SITE CHRONOLOGY

A list of important Site 19 historical events and relevant dates in the site chronology is shown below. The identified events are illustrative, not comprehensive.

Event	Date
Landfill operations.	1943 to 1960
Final IAS completed.	1982
Phase I Site Inspection/IRP Phase II Confirmation Study completed.	1986
Phase II Site Inspection completed	1993
RI completed.	1996
FS completed.	1997
PP issued.	March 1997
Public Meeting.	April 1997
ROD signed.	September 1997
RD completed.	February 1998
Remedial Action began.	February 1998
Remedial Action completed	July 2000
Site 19 Close Out Report issued.	September 1998
Long-Term Monitoring Work Plan for Site 19 issued.	May 2000
Groundwater Monitoring Program (quarterly sampling) initiated.	May 2001
Revised Groundwater Monitoring Program (annual sampling).	ongoing

4.2 BACKGROUND

Site 19 was a 300-foot circular area half paved with asphalt and half covered by gravel (Figure 4-1). Paint chips and sludges from an ordinance maintenance area were disposed from the early 1940s until the early 1960s in the topographic depression at the site. Paint slurries and solvent residues were also discharged into an open drainage swale. The disposal site was a depression that was 50 feet in diameter with a depth ranging from 5 to 10 feet. The paved portion of the site is currently used to train Navy forklift operators. A drainage swale ran from the disposal depression to a small stream in the wetlands adjacent to the site. It was reported that a significant quantity of waste was disposed at the site over a period of 10 years.

Site 19 is located near the former Building S-34 off of Tulagi Road. It was believed that a significant portion of the contaminated material (impacted soils) may have been removed from Site 19 during the construction of barricade facilities in the early 1970s. The site is surrounded by woodlands with a wetlands area to the west. Site 19 included a small drainage ditch that ran from the depression to a stream approximately 500 feet to the southwest. The site is at a higher elevation than the stream, a tributary of the Mingamahone Brook. Water was present in the drainage depression only after periods of heavy rainfall. The stream southwest of the site is surrounded by wetlands. The wetlands, including the stream, drain to the south. Damming of the stream near the power lines west of the site has created a small pond north of the dam.

Regional geologic mapping indicates that Site 19 is within the outcrop area of the Kirkwood Formation, which ranges between 60 and 100 feet in thickness. The lithology of the sediments encountered in the on-site soil borings generally agrees with the published descriptions of the Kirkwood and Vincentown Formations. Assuming a portion of the Kirkwood Formation was removed by erosion, it is possible that the soil borings penetrated the underlying Vincentown Formation. In general, the borings encountered brown and yellowish-brown, fine- to medium-grained sand, silty sand, sandy silt, and silt (probably representative of the Kirkwood Formation) and glauconitic, fine- to medium-grained sand (probably representative of the Vincentown Formation). Mainside is located above the up-dip limit of the Piney Point, Shark River, and Manasquan Formations; therefore, the glauconitic sand is interpreted to be part of the Vincentown Formation. Based on the boring log descriptions, the wells penetrated the Kirkwood and Vincentown Formations.

Groundwater in the Kirkwood and Vincentown aquifer beneath the site occurs under unconfined conditions, and the formations are interpreted to be hydraulically interconnected. The direction of shallow groundwater flow in the aquifer, as indicated by August and October 1995 groundwater measurements, is westerly. There does not appear to be significant seasonal variation in groundwater flow direction. The hydraulic conductivities calculated for MW19-04 and MW19-05 are 6.91×10^{-4} cm/sec (1.96 ft/day) and 1.06×10^{-3} cm/sec (3.00 ft/day), respectively in the RI.

The IAS did not recommend further investigation at Site 19 because it was believed that impacted soils were removed in the early 1970s; however, the site was still included for further study. The 1986 Site Investigation (SI) found elevated metals concentrations in surface soils within the disposal depression and near the beginning of the drainage swale. The maximum concentrations detected were cadmium (31,900 mg/kg), lead (1,560 mg/kg), and chromium (639 mg/kg).

During the Phase II Site Investigation, groundwater samples showed elevated concentrations of metals, and shallow soils (0 to 2 feet) showed low concentrations of two VOCs, methylene chloride and acetone, and metals. VOC detections were believed to be laboratory contaminants and not actually site related. Lead was found at concentrations of up to 12,600 mg/kg in the upper 2 feet of soil in the surface depression, and up to 379 mg/kg in the drainage swale. Cadmium was found at concentrations of up to 33.7 mg/kg in the upper 2 feet of soil in the topographic depression.

Results of the RI, to determine whether contamination in surface soil/sediments had leached to subsurface soils, showed that metals concentrations in deeper subsurface soil sample did not exceed applicable screening criteria. The absence of site-related VOCs in subsurface soils was also confirmed. The presence of metals (antimony, arsenic, cadmium, thallium, and zinc) in groundwater was confirmed. In general, exceedances of metals COPCs were found in MW19-07, directly downgradient of the topographic depression. Figure 4-1 depicts sample locations. Table 4-1 summarizes the results of samples obtained from the groundwater monitoring wells compared to applicable standards.

Computer modeling estimated that Site 19 groundwater metal concentrations would gradually diminish over a long period of time assuming source removal and control measures would be implemented. The model indicated that metals concentration at the nearest potential discharge point, a stream located approximately 500 feet downgradient (west) of Site 19, would be significantly less than State standard or background concentrations. The maximum distance from Site 19 where metals concentrations in groundwater would remain at concentrations greater than applicable regulatory standards or background concentrations was estimated to be 191 feet by the model.

In summary, results of investigations at Site 19 indicated that:

- No organic compounds were found in groundwater at concentrations above regulatory standards.

- Metals contamination at concentrations above regulatory standards in Site 19 soils appear to be limited to the topographic depression and the drainage swale shallow surface soil and sediment.

- Metals were found in groundwater at concentrations slightly above regulatory standards near the downgradient end of the topographic depression.

The HHRA concluded that the cancer risks associated with future residential exposure to groundwater at Site 19 were in excess of the acceptable target risk range. The primary contaminant contributing to this risk was arsenic (via ingestion of groundwater). Noncarcinogenic HIs exceeded 1.0 for the future industrial and future residential exposure scenarios. Thallium and arsenic were the primary contaminants contributing to this risk (also via ingestion of groundwater).

Contaminants exceeding groundwater standards included aluminum, antimony, arsenic, cadmium, iron, lead, manganese, and thallium. Contaminants in subsurface soil samples that exceeded standards included antimony, cadmium, hexavalent and total chromium, lead, and zinc. It should be noted that most exceedances were found at one well (MW19-07) directly adjacent to the area of concern.

The ERA concluded that high concentrations of contaminants, primarily metals, had migrated from the site to the drainage ditch that leads to a tributary of Mingamahone Brook and adjacent wetlands. Sediment concentrations of lead, chromium, cadmium, and zinc in the surface depression and drainage ditch were well above ecological screening toxicity values. In addition, although extensive migration of contaminants in groundwater had not occurred, groundwater discharges into the wetlands thereby providing a potential exposure pathway.

4.3 REMEDIAL ACTIONS

Based on the results of the RI/FS process, it was determined that a remedial action was necessary for Site 19. A ROD for Site 19 was signed in September 1997 (DON, 1997b). The following sections describe the process used to select and implement the appropriate remedial action for Site 19.

4.3.1 Remedy Selection

An FS for Site 19 (B&RE, 199a7) was completed in response to the recommendations of the RI. The FS evaluated several remedial alternatives. Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soils, sediments, or groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail.

The FS concluded that excavation and off-site disposal of contaminated soil and sediments, institutional controls, asphalt covering over the former (excavated/removed) depression, and long-term groundwater monitoring should be the preferred remedial alternative. The Navy, with the support of USEPA and in consultation with NJDEP selected this alternative, presented it in the PP in March 1997, and formally

selected it in the ROD signed in September 1997. This alternative is includes a CEA (institutional controls) as required by the State groundwater quality protection criteria. The CEA covers the area immediately adjacent to the former paint chip and sludge disposal area. Excavation and off-base disposal of contaminated sediments and soils prevents further leaching of metals to groundwater. This alternative reduces unacceptable human health risks and threats to ecological receptors in the vicinity by removing the metals-laden sediments and contaminated soil for disposal off site.

Based on ARARs and risk assessment results, the following RAOs were selected for Site 19:

- Prevent potential human exposures to contaminated soils and sediments.
- Prevent potential human exposures to contaminated groundwater.
- Minimize contaminant migration into groundwater and the adjacent wetlands and restore the aquifer to applicable standards.

The remedy selected for Site 19 will meet the RAOs. The selected remedy is a removal option, as defined in the ROD, consisting of the following components:

- Excavation and off-site disposal of contaminated soils and sediments – Excavation and off-site disposal reduces the risks by the elimination of the contaminant source. This component reduces unacceptable human health risks and threats to ecological receptors in the vicinity of Site 19 by removing the metals-laden sediments and contaminated soil.

- Institutional Controls - Institutional controls bar the use of groundwater during the remediation period. The institutional controls include establishment of a CEA immediately adjacent to the former paint chip and sludge disposal area. Because site groundwater does not meet New Jersey groundwater quality standards, the CEA pursuant to N.J.A.C. 7:9-6 provides the state official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is suspended until standards are achieved.

- Groundwater Monitoring – Long-term, periodic monitoring is conducted to assess contaminant status and potential threats to human health and the environment. The long-term, periodic monitoring program allows the Navy and regulatory agencies to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. Over time, the contaminants in groundwater will likely attenuate naturally through physical and chemical processes. The removal action will also prevent further leaching of metals to groundwater.

Implementation of this remedial alternative complies with the ARARs identified in the FS. While the RAO for groundwater protection will not be immediately achieved, risks are reduced by the removal of the contaminated material and continued monitoring to evaluate contaminant trends. Long-term, periodic monitoring and analysis will determine when this RAO is achieved. The CEA is in place in the area immediately adjacent and downgradient of the site to protect potential receptors until the groundwater standards are achieved. This alternative is believed to provide the best balance of protection among the alternatives with respect to response criteria.

The remedy selected for Site 19 satisfies the remedy selection requirements of CERCLA and the NCP. Based on available information, the Navy and USEPA believe the remedy is protective of human health and the environment, is cost effective, and is in compliance with the statutory requirements of USEPA, the State, and the local community.

4.3.2 Remedy Implementation

The Remedial Design for Site 19 began in November 1997. It was completed for the Navy by a contractor in February 1998.

The RD identified approximately 260 cubic yards of contaminated soils and sediments from the topographic depression and the drainage ditch that would be excavated using common construction equipment such as bulldozers or loaders. The contaminated soil and sediments had concentrations of metals in excess of the selected clean-up goals. The below-ground overflow pipe that connected the topographic depression to the drainage ditch was also removed to prevent contaminant migration through the pipe.

The Navy's RAC mobilized to the site to begin construction activities in February 1998, and the remedial action was completed in July 2000. Details regarding the remedial action are summarized in the Site 19 Close-Out Report (FWENC 1998b). Vegetation and trees in the settling basin and drainage ditch were removed and disposed of. Sediment in the basin was excavated to a depth of 2 feet, and to a depth of 6 inches in the drainage ditch near the basin outfall and the tributary of the Mingamahone Brook. Confirmatory sample analysis confirmed removal of impacted soil or sediment in compliance with applicable action criteria.

To ensure of the quality of the remedial action, quality control testing and inspection were completed during the remedial action in accordance with the CQC Plan and the MQA/CQA) Plan.

The capital cost for implementation of the preferred remedial alternative was estimated at $375,000 in the ROD. This estimate included costs associated with site preparation, excavation, backfilling, site grading, and confirmatory sampling. The actual final cost for implementation was approximately $350,000 due to savings derived from using the same contractor who was already mobilized at Sites 4 and 5.

To meet the institutional control requirements in the ROD, the Navy has placed land use restrictions into the Base Master Plan to restrict use of contaminated groundwater at IR Site 19 at NWS Earle. Implementation of the CEA under NJDEP guidelines ensures that untreated groundwater beneath the site will not be used for a drinking water source.

Components of the remedial action, including long-term groundwater monitoring, are discussed below in Section 4.3.3.

4.3.3 System Operations/Operations and Maintenance

The Navy implemented a monitoring program at Site 19 in May 2001. The results of the program are being used to assess the effectiveness of the remedial action. Quarterly sampling has been completed at the site since the program was initiated in accordance with the Final Long-Term Monitoring Work Plan for Operable Unit 2, Site 19 [EA Engineering, Science, and Technology [EA], 2001]. Four quarters of annual sampling have been completed as of February 2002, and one annual report has been prepared to document the results of the monitoring program. The report was submitted to the USEPA and NJDEP for review and comment. USEPA and NJDEP have reviewed the annual report and concur with the Navy's recommendations to reduce the frequency of periodic monitoring to annual as well as other changes (Appendix C). The results of the groundwater monitoring program are discussed in Section 4.4.2.

The average annual O&M costs (includes long-term monitoring of groundwater, sediment, and surface water) were estimated at $21,600 per year for 30 years, and five-year reviews cost were estimated at$15,500 per event in the ROD. The actual cost for the long-term monitoring at Site 19 is approximately $31,000/year. This estimate includes the costs associated with sampling, analysis, validation, and reporting. Costs associated with preparing the Long-term Monitoring Work Plan for Site 19 and installing the groundwater monitoring well/surface water monitoring network were not included in the estimate.

4.4 FIVE-YEAR REVIEW FINDINGS

4.4.1 Site Inspection

A site inspection was conducted at Site 19 in January 2003 (and also during periodic groundwater sampling). Features inspected during the inspection at Site 19 included general conditions of the former disposal site, drainage ditch, vegetation/sedimentation, and the status of monitoring wells. Weather conditions during the inspection were favorable, with sun, mild temperatures and no precipitation. A representative from TtNUS performed the inspection. Photographs taken of the site during the inspection are provided in Appendix A. A site inspection checklist was completed during the inspection. The completed checklist is provided in Appendix B.

The site inspection included visual observations of the current condition of the soil/sediment removal area, the asphalt covering over the former settling basin, the former drainage channel, and the wetlands adjacent to Site 19. During the site inspection, the inspector found that the land use for the site has remained unchanged since the remedial action was completed. No evidence of access to the area of soil/sediment removal of any kind was apparent. Monitoring wells were secured by locking caps and appeared to be in good condition. No deficiencies of any kind were noted.

4.4.2 Document and Analytical Data Review

4.4.2.1 Document Review

The major documents reviewed for the five-year review are listed below, and key information obtained from the documents is summarized in the following paragraphs.

- RI Report
- FS for Sites 4, 5, 19, and 26
- ROD, OU 2, Site 19
- Remedial Design Report for Site 19
- Site 19 Close Out Report
- Long-term Monitoring Work Plan for Site 19
- Annual Long-Term Monitoring Report for Site 19

A review of the RI, FS, and ROD for Site 19 provided the background for the site, RAOs, ARARs, and a description of the selected remedy for the site. The review also provided the cost estimate for the remedial alternative.

A review of the Revised Design Report for Site 19 provided the details of the design of the removal operations and asphalt cover specifications. The design also included a detailed cost estimate.

A review of the Site 19 Close Out Report provided the details of excavation and disposal activities. The report summarized confirmatory sampling and quality assurance and control testing and inspections performed during the removal action.

A review of the Long-term Monitoring Work Plan for Site 19 provided the monitoring network to be used for the collection of the groundwater, surface water, and sediment samples. The plan also detailed the analytical program, monitoring criteria, and data evaluation approach.

A review of the Annual Long-Term Monitoring Report for Site 19 provided an updated understanding of the site. The results of this groundwater, surface water, and sediment monitoring were compared to historical data and were used as the basis for conclusions and recommendations for potential future actions at the site.

4.4.2.2 Data Review

The Navy implemented a monitoring program at Site 19 in May 2001. The results of the program are being used to assess the effectiveness of the remedial action. A summary of the conclusions and recommendations from the annual long-term monitoring report for Site 19 is provided below. Table 4-1 summarizes the analytical data collected during the program. The chemicals provided in the table are the COPCs identified in the RI, FS, and ROD. The criteria used to screen the data are also provided in the table. The primary criteria are the NJDEP Cleanup Standards for Contaminated Sites. Figure 4-2 is a tag maps showing groundwater data that exceeded applicable criteria.

No organic compounds were encountered in groundwater at levels greater than regulatory criteria.

Groundwater analytical results indicated that aluminum and iron were the only metals found at concentrations greater than NJDEP criteria. Aluminum and iron were present at concentrations lower than the corresponding background concentrations. Six other metals, antimony, arsenic, cadmium, lead, manganese, and thallium, found at concentrations exceeding regulatory limits in the RI, were encountered at concentrations below their respective regulatory criteria.

No metals were found in surface water at concentrations in excess of NJDEP criteria. Two metals, copper and mercury, found at concentrations exceeding regulatory limits in the RI, were not detected.

Cadmium was found in a site sediment sample at a concentration of 0.75 mg/kg, slightly exceeding the NJDEP regulatory criterion of 0.6 mg/kg during the final sampling event of the reporting period. Three other metals, arsenic, chromium, and lead, found at concentrations exceeding regulatory limits in the RI, were encountered at concentrations below their respective regulatory criteria.

4.4.3 ARAR and Site-Specific Action Level Changes

The remedial action implemented at Site 19 included excavation and off-site disposal of the contaminated soil and sediment, institutional controls, and long-term monitoring. ARARs and TBCs were reviewed to determine whether there have been changes since the ROD was signed. The chemical-specific, location-specific, and action-specific ARARs, advisories, and guidance values (TBCs) that have changed are provided in the table below. Changes associated with monitoring are addressed in the response to Question 2 of Section 4.5, Assessment.

The ERA for Site 19 indicated that high concentrations of contaminants, primarily metals, have migrated from the site to the drainage ditch that leads to a tributary of Mingamahone Brook and adjacent wetlands. Sediment concentrations of lead, chromium, cadmium and zinc in the surface depression and drainage ditch are well above ecological screening toxicity values. Also, groundwater discharges into the wetlands provided a potential exposure pathway, although extensive migration of contaminants in groundwater has not occurred. The remedial action of excavation and off-site disposal of the contaminated soil and sediment implemented at Site 19 reduced the risks by eliminating the contaminant source. This reduced the threat to ecological receptors in the vicinity. The confirmatory samples confirmed removal of impacted soil or sediment in compliance with applicable action criteria. Therefore, changes in the screening values since the completion of the ERA would not impact the effectiveness of the remedial action.

Contaminant	ARAR/Site-Specific Level		Source
Groundwater			
Arsenic	Previous	50 µg/L	Primary Drinking Water Standard
	Previous	8 µg/L	NJDEP Groundwater Quality Standard
	New	10 µg/L	Primary Drinking Water Standard
Surface Water			
Aluminum	Previous	87 µg/L	USEPA AWQC
	New	Reserved	NJDEP Surface Water Quality Standards
Antimony	Previous	160 µg/L	USEPA Region 4 Screening Value
	New	0.017 µg/L	NJDEP Surface Water Quality Standards
Arsenic	Previous	190 µg/L	USEPA AWQC
	New	0.017 µg/L	NJDEP Surface Water Quality Standards
Barium	Previous	3.9	USEPA Tier II

Contaminant	ARAR/Site-Specific Level		Source
	New	2000 µg/L	NJDEP Surface Water Quality Standards
Beryllium	Previous	5.1 µg/L	USEPA Tier II
	New	Reserved	NJDEP Surface Water Quality Standards
Chromium	Previous	10 µg/L	USEPA AWQC
	New	160 µg/L	NJDEP Surface Water Quality Standards
Copper	Previous	11 µg/L	USEPA AWQC
	New	Reserved	NJDEP Surface Water Quality Standards
Lead	Previous	2.5 µg/L	USEPA AWQC
	New	5 µg/L	NJDEP Surface Water Quality Standards
Manganese	Previous	80 µg/L	USEPA Tier II
	New	100 µg/L	NJDEP Surface Water Quality Standards
Mercury	Previous	1.3 µg/L	USEPA AWQC
	New	0.144 µg/L	NJDEP Surface Water Quality Standards
Nickel	Previous	160 µg/L	USEPA AWQC
	New	516 µg/L	NJDEP Surface Water Quality Standards
Selenium	Previous	5 µg/L	USEPA AWQC
	New	10 µg/L	NJDEP Surface Water Quality Standards
Silver	Previous	0.01 µg/L	USEPA Region 4 Screening Criteria
	New	164 µg/L	NJDEP Surface Water Quality Standards
Thallium	Previous	4 µg/L	USEPA Region 4 Screening Criteria
	New	1.7 µg/L	Surface Water Quality Standards
Zinc	Previous	100 µg/L	USEPA AWQC
	New	Reserved	NJDEP Surface Water Quality Standards
Sediment			
Arsenic	Previous	8.2 mg/kg	Environmental Management
	New	6 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Barium	Previous	40 mg/kg	Sediments: Chemistry and Toxicity of In-Place Pollutants
	New	None	NJDEP Guidance For Sediment Quality Evaluations
Cadmium	Previous	1.2 mg/kg	Environmental Management
	New	0.6 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Chromium	Previous	81 mg/kg	Environmental Management
	New	26 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Copper	Previous	34 mg/kg	Environmental Management
	New	16 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Lead	Previous	47 mg/kg	Environmental Management
	New	31 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Manganese	Previous	460 mg/kg	Guidelines for the Protection and Management of the Aquatic Sediment Quality in Ontario (1992)
	New	None	NJDEP Guidance For Sediment Quality Evaluations

Contaminant	ARAR/Site-Specific Level		Source
Mercury	Previous	0.15 mg/kg	Environmental Management
	New	0.2 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Nickel	Previous	21 mg/kg	Environmental Management
	New	3.01 mg/kg	NJDEP Guidance For Sediment Quality Evaluations
Zinc	Previous	150 mg/kg	Environmental Management
	New	120 mg/kg	NJDEP Guidance For Sediment Quality Evaluations

4.5 ASSESSMENT

The following conclusions support the determination that the remedy for Site 19 is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

- ***HASP/Contingency Plan:*** An O&M program is being implemented at Site 19. The results of the program are being used to evaluate the removal action performance. The data do not indicate any significant contaminant migration concerns. Should groundwater data indicate the need to evaluate additional remedial actions at some point in the future, the Navy will perform the evaluation at that time.

- ***Implementation of Institutional Controls and Other Measures:*** Institutional controls associated with Site 19 are being implemented in accordance with the CEA for Site 19. These controls meet the intent of the institutional controls RAO discussed in Section 4.3.1. At the time of the site inspection, the asphalt covering the remediated former disposal depression was in good repair. Monitoring wells appear to be locked at all times except for periodic sampling. There was no evidence of unauthorized access.

- ***Remedial Action Performance:*** The removal action has been completed at Site 19. The confirmatory samples confirmed removal of impacted soil or sediment in compliance with applicable action criteria. The removal action is currently effective in reducing unacceptable human health risks and threats to ecological receptors in the vicinity of Site 19 and preventing further leaching of metals to groundwater. A long-term monitoring program is being implemented to evaluate the removal action performance. Proper O&M (long-term monitoring) is necessary to evaluate the effectiveness of the removal action.

- ***System Operations/O&M:*** The removal action was completed in July 2000. The removal action was completed as intended; an O&M plan has been developed and implemented, and O&M (long-term monitoring) has been performed at the site since the removal action was completed.

- ***Cost of Operations/O&M:*** Actual costs for the current long-term monitoring program are approximately $31,000 per year.

- ***Opportunities for Optimization:*** The frequency of sampling for the long-term monitoring program has been quarterly and can be reduced to annually [recommendation in the Annual Long-Term Monitoring Report for Site 19 (EA, 2000)] or every 2 years. The analytical parameter list for the groundwater monitoring program currently includes the TAL of 24 metals and could be reduced to the COPCs (aluminum, arsenic, chromium, iron, etc.). Changes in the monitoring program as proposed here and in the Annual Long-Term Monitoring Report for Site 19 (EA, 2000) should be considered now.

- ***Early Indicators of Potential Remedy Failure:*** There were no deficiencies noted in the removal action that has been completed and the O&M being completed. The presence of cadmium at a concentration near the regulatory criterion should be reviewed at the next periodic monitoring event.

Question 2. Are the assumptions used at the time of the remedy selection still valid?

- ***Changes in Standards and TBCs***: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the ROD was signed. As presented in Section 4.4.3, there have been minor changes to currently relevant ARARs. The changes in the Primary Drinking Water Standards and the NJDEP Cleanup Standards for Contaminated Sites do not impact the protectiveness of the remedy.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** There have been no changes in the human health toxicity criteria that will impact the primary or secondary monitoring criterion. Changes in the toxicity factor occurred for manganese (RfD increase), but this did not affect the risks calculated using the latest monitoring event data, in which manganese as well as several other metals previously included as COPCs in the original RI were not detected. The latest sample results showed that two metals (aluminum and iron) still exceeded applicable groundwater standards.

- ***Changes in Risk Assessment Methodologies:*** As discussed in Section 1.4, there have been no major changes in HHRA or ERA methodology since the signing of the ROD.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

4.6 DEFICIENCIES

No deficiencies were identified during the five-year review of the site.

4.7 RECOMMENDATIONS AND REQUIRED ACTIONS

Based on the results of the site inspection and review, the following recommendations and actions are required for Site 19.

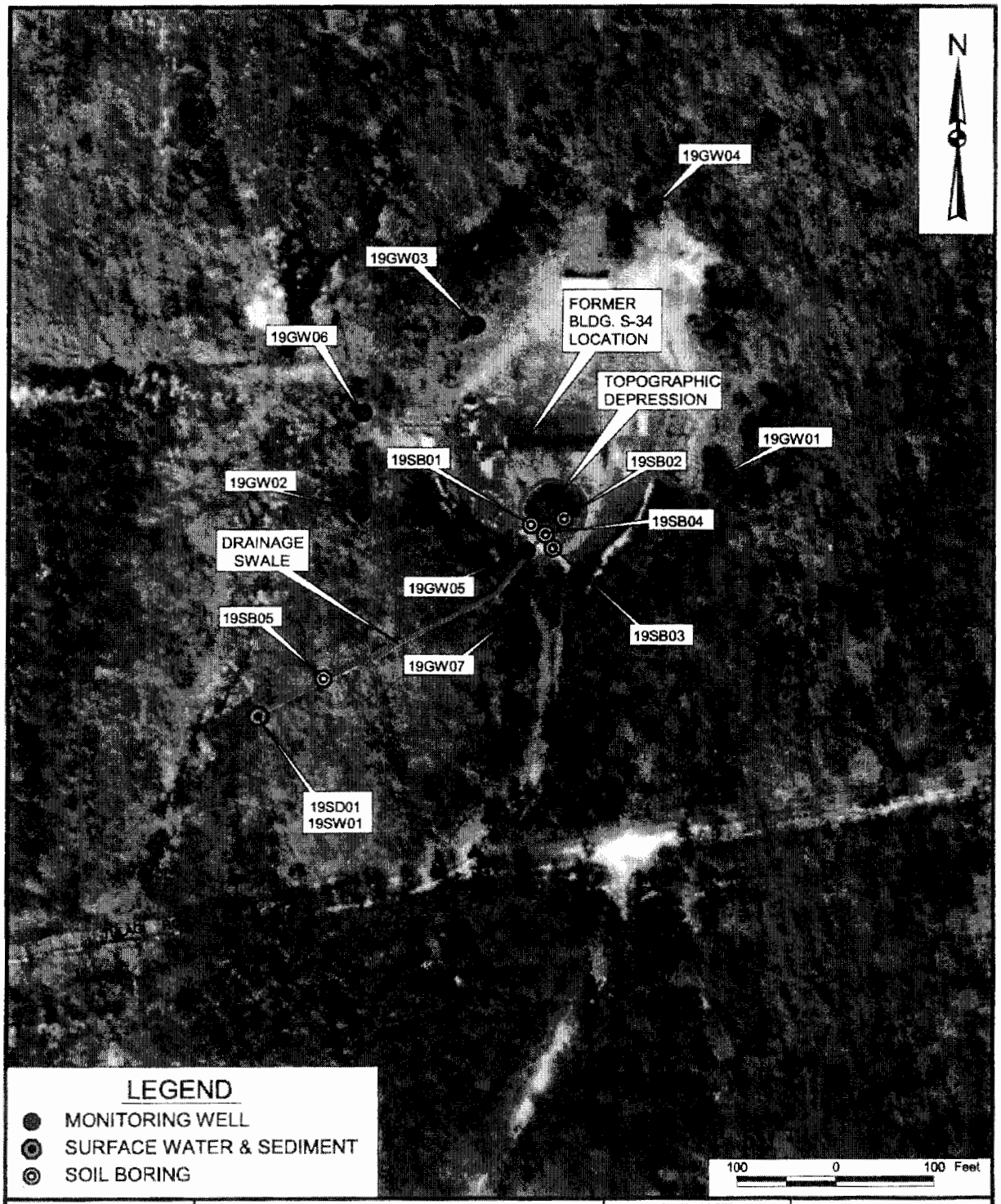
- Continue to conduct the long-term monitoring in accordance with the Long-term Monitoring Work Plan for Site 19 and the recommendations identified in this Five-Year Review and the Annual Long-Term Monitoring Report for Site 19 (EA, 2000). A reduction in the sampling frequency to every 2 years should be considered (i.e., collect samples in 2005 and 2007).

- Continue enforcement of institutional controls (CEA).

4.8 PROTECTIVENESS STATEMENT

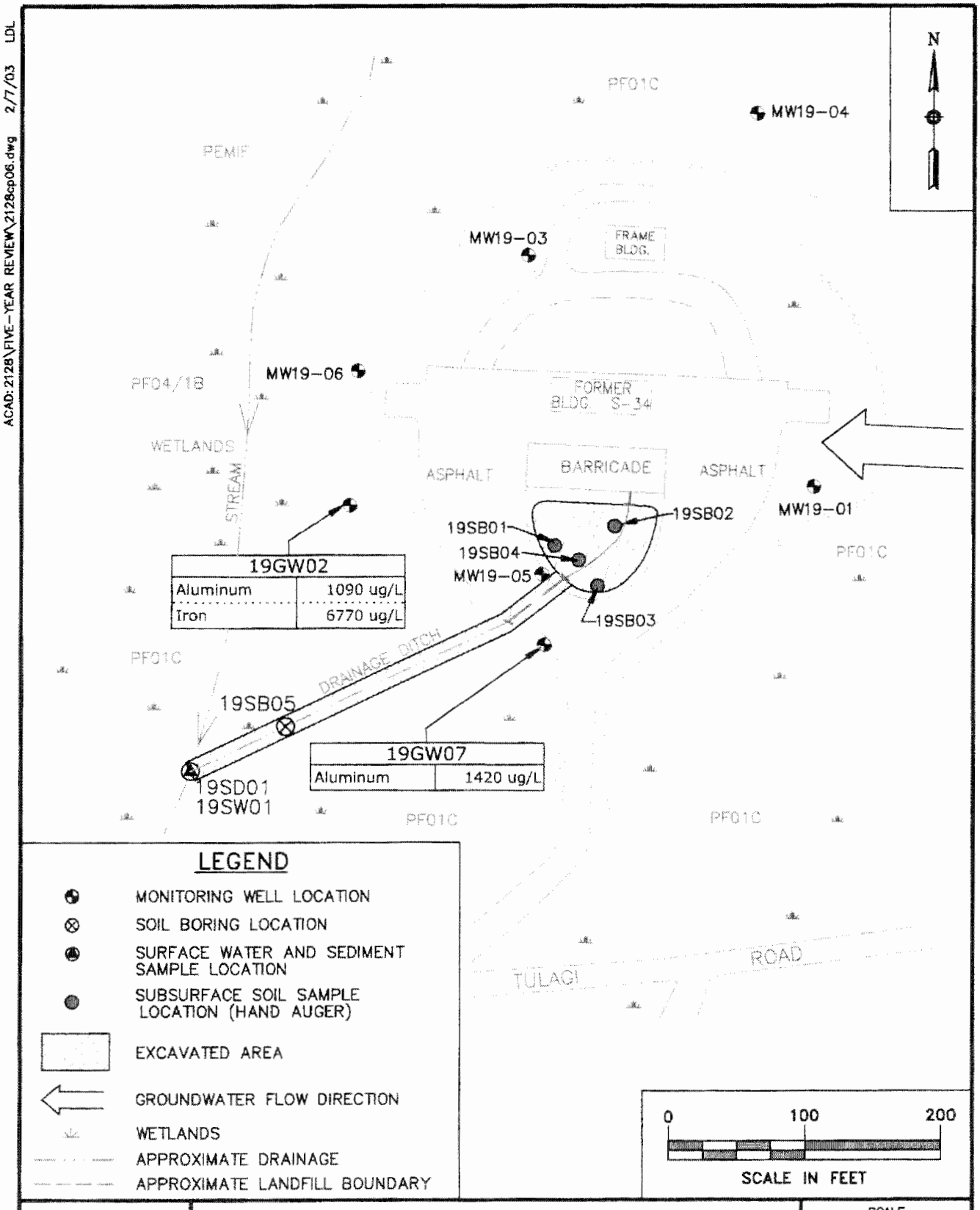
The remedy at Site 19 is currently protective of human health and the environment. The source of contamination has been removed. The removal action reduced the unacceptable human health risks and threats to ecological receptors in the vicinity of Site 19 by eliminating the contaminant source and preventing further leaching of metals to groundwater. A long-term monitoring program is being implemented to verify that the removal action is performing as designed. The results of the monitoring program suggest that the removal action is performing as planned. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The institutional controls, through the CEA, place restrictions on use of site groundwater.

The Navy, USEPA, and NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 19. Based on the completed activities and the activities that are underway or planned, the intent and goals of the ROD for Site 19 have been or will be met.



DRAWN BY: LDL — DATE: 1/28/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128	OWNER NO.: FIVE-YEAR REVIEW
CHECKED BY: RFD — DATE: 2/6/03	SITE PLAN OPERABLE UNIT 2, SITE 19 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	NWS-Earle_5YearReview.apr FIVE-YEAR REVIEW-SITE 19	
COST/SCHEDULE-AREA		APPROVED BY: RET — DATE: 2/26/03	
SCALE: AS NOTED		DRAWING NO.: FIGURE 4-1	REV

R:\GIS\GIS\Projects\NWS Earle\5YearReview.apr 1/28/03 LDL PHL



TETRA TECH NUS, INC.

GROUNDWATER CONCENTRATIONS ABOVE REGULATORY CRITERIA

OPERABLE UNIT 2, SITE 19

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE:	2128cp06.dwg LDL PHL
REV	DATE 2/18/03
FIGURE NUMBER	FIGURE 4-2

TABLE 4-1

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER
OPERABLE UNIT 2, SITE 19
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Last Long-Term Monitoring Event[2]	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection[1]	Maximum Concentration	USEPA/NJDEP
INORGANICS (µg/L)						
Aluminum	6/6	9610	1420	11/11	7870	NS/200
Antimony	1/6	6.7	ND	0/11	ND	6/20
Arsenic	2/6	27.4	ND	1/11	5.8	10/8
Barium	6/6	753	ND	11/11	518	2000/2000
Beryllium	2/6	1	ND	4/11	1.6	4/20
Cadmium	6/6	7.5	1.9	5/11	1.9	5/4
Chromium	6/6	43.1	19	0/11	ND	100/100
Copper	3/6	17.5	12	9/11	13.5	1300/1000
Iron	6/6	4880	6770	11/11	7690	NS /300
Lead	5/6	17.2	4.1	3/11	3	15/10
Manganese	6/6	185	ND	11/11	65	NS /50
Mercury	6/6	0.12	ND	11/11	0.12	2/2
Nickel	6/6	25.4	5.2	10/11	25.5	100/100
Selenium	1/6	27.2	ND	1/11	5.3	50/50
Thallium	1/6	28.9	ND	3/11	5.1	2/10
Zinc	4/6	694	234	6/9	348	NS /5000

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.
[2] October 1, 2002.
[3] USEPA Maximum Contaminant Level/NJDEP Ground Water Quality Standards N.J.A.C. 7:9-6.
Shading indicates that the value is greater than regulatory criteria.
ND = Not detected.
NS = No standard.

TABLE 4-2

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN IN SURFACE WATER
OPERABLE UNIT 2, SITE 19
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Last Long-Term Monitoring Event[2]	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection[1]	Maximum Concentration	AWQC/NJDEP
INORGANICS (µg/L)						
Copper	1/1	16.4	ND	2/3	9.8	11/Reserved
Iron	1/1	1140	424	3/3	702	NS/Reserved
Lead	1/1	3.1	ND	1/3	4.4	3.2/5
Mercury	1/1	0.02	ND	2/3	0.028	0.012/0.144

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] October 1, 2002.

[3] Ambient Water Quality for Freshwater Chronic Aquatic Life/NJDEP Surface Water Criteria for Protection of Human Health.

Shading indicates that the value is greater than regulatory criteria.

ND = Not detected.

NS = No Standard.

TABLE 4-3

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN IN SEDIMENT
OPERABLE UNIT 2, SITE 19
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Last Long-Term Monitoring Event[2]	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection[1]	Maximum Concentration	
INORGANICS (mg/KG)						
Arsenic	1/1	26	ND	2/3	6.2	8.2
Cadmium	-	-	0.751	-	-	0.6
Chromium	1/1	430	13.3	3/3	56	26
Lead	1/1	60.3	20.9	3/3	34.3	31

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] October 1, 2002.

[3] Sediment Ecological Toxicity Threshold Values from Fresh Water Sediment Screening Guidelines Ontario (Persaud, et. al., 1993).
Shading indicates that the value is greater than regulatory criteria.
ND = Not detected.

5.0 OPERABLE UNIT 3, SITE 26 - EXPLOSIVE "D" WASHOUT AREA

Site 26 under the Navy's IRP is comprised of the former process leach tank connected to Building GB-1, associated soil, and the PCE and TCE contaminated groundwater plume that apparently emanated from the tank. This five-year review is being conducted as a matter of policy until the cleanup levels are achieved, and unlimited use and unrestricted exposure is permitted. Implementation of the remedial actions at Site 26 began in 1999. This five-year review consists of data for the remedial action for soil and groundwater and provides a detailed review of the soil remedial action and a current status update for the groundwater remedial action. According to the USEPA, 5 years of sampling data are necessary to establish contaminant trends needed to draw conclusions on the effectiveness of groundwater remedial action. A more detailed review of the groundwater remedial action will need to be conducted at the next Five-Year Review.

5.1 HISTORY AND SITE CHRONOLOGY

A list of important Site 26 historical events and relevant dates in the site chronology is shown below. The identified events are illustrative, not comprehensive.

Event	Date
Site 26 Process Leach Tank operation.	Unknown
Final IAS completed.	1982
Phase I Site Inspection/IRP Phase II Confirmation Study completed.	1986
Phase II Site Inspection completed.	1993
RI completed.	1996
FS completed.	1997
PP issued.	December 1997
Public Meeting.	January 1998
ROD signed.	September 1998
Process Leach Tank and Soil Removal Action.	1998
RD completed.	February 2000
Additional Groundwater Investigation	March 2000
Air Sparging/Soil Vapor Extraction (AS/SVE) System Installation	December 2000
AS/SVE System Operations and Maintenance Manual	June 2001
Groundwater Monitoring Program initiated.	March 2001
Groundwater Monitoring.	Ongoing quarterly

5.2 BACKGROUND

Site 26, which is approximately 200 by 200 feet in size, is situated at the intersection of Macassar and Midway Roads (Figure 5-1). Two railway lines adjacent to the site run toward the northeast. The ground surface at the site is relatively flat, approximately 150 feet above msl. The process leaching system, located approximately 24 feet north of the western end of Building GB-1 consisted of a grease trap and a cesspool-like leach tank, approximately 10 feet by 10 and 6 feet deep, and was apparently used for undocumented process waste disposal. The bottom of the leach tank was located about 3 to 4 feet above high water table level, which is approximately 10 to 14 feet below ground surface in the area. A figure of Site 26 showing the historical location of the former process leach tank and the contaminated groundwater plume at the site is provided on Figure 5-2.

For one year in the late 1960s, Building GB-1 was used for the removal and recovery of ammonium picrate (known as explosive D) from artillery shells. The water-soluble explosive was removed from the shells by a hot water wash. The resulting solution flowed into a cooling/settling tank inside the building. Upon cooling, the ammonium picrate precipitated and was collected for reuse or disposal. Overflow from the settling tank flowed into a tile-lined open pipe to a separate leach field north of the eastern end of Building GB-1. Building GB-1 was reportedly also used for the reconditioning of munitions casings and shells using solvents. Spent solvents and wash waters were discarded into an unknown receptacle, possibly a collection tray at a former paint spray booth at the western end of Building GB-1 that was connected to the process leaching system. The GB-1 process leaching system was apparently used for disposal of TCE, 1,2-DCE, and/or related compounds. GB-1 is no longer used for processing activities, and the facility is currently being used to house the Site 26 AS/SVE groundwater treatment equipment, warehousing, and storage.

Site 26 is surrounded by wooded upland areas dominated by pitch pine, blackjack oak, blueberry, and *Clethra sp.* NJDEP Geographic Information System data initially indicated the presence of wetlands where the wooded upland areas are located; however, on-site inspection revealed that no wetlands are present in the area. Soils in this area contain no evidence of saturation, no wetland hydrology is present, and no streams or watercourses exist near the site. The closest wetlands are located approximately 300 yards to the northwest. The East Branch of Mingamahone Brook is located approximately 300 yards southwest of Site 26, and the site is in the Mingamahone Brook watershed.

Regional geologic mapping indicates that Site 26 is in the outcrop area of the Kirkwood Formation. The Kirkwood Formation ranges between 60 to 100 feet in thickness. Soil borings completed during the investigations of the site were no more than 24 feet deep, and cone penetrometer (CPT) lithologic profile locations were no more than 100 feet deep. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the upland gravel and the Kirkwood Formation. In

general, the borings encountered light yellowish-brown sand and gravel (probably representative of the upland gravel) and brownish-yellow, brown and gray, fine- to medium-grained and medium- to coarse-grained sand (probably representative of the Kirkwood Formation). Based on CPT lithologic profiling, the upper approximate 25-foot section penetrated was sand. Silty clay and clayey silt were penetrated from approximately 25 to 45 feet, and sand was encountered from approximately 45 to 70 feet. Clayey silt was encountered from approximately 80 to 87 feet in one of the CPT locations.

Groundwater in the Kirkwood aquifer beneath the site occurs under unconfined conditions. Depth to groundwater ranges from approximately 10 to 14 feet below ground surface. The direction of shallow groundwater flow in the aquifer, as indicated by groundwater measurements, is toward the southwest. There does not appear to be a significant seasonal variation in groundwater flow direction. Based on boring log descriptions, the wells are screened in the Kirkwood Formation. The hydraulic conductivity values calculated for MW26-01, MW26-03, and MW26-04 are 3.85×10^{-4} cm/sec (1.09 ft/day), 1.92×10^{-3} cm/sec (5.44 ft/day), and 7.09×10^{-4} cm/sec (2.01 ft/day), respectively from the RI.

Based on pore pressure plots, the water table was encountered at approximately 10 feet, and a lower water bearing zone was encountered at approximately 43 feet below ground surface. The clayey, silty zone encountered between approximately 25 and 45 feet below ground surface shows a sharp rise in pre-pressure, indicating this zone probably serves as a semi-confining layer. Two pieces of evidence corroborate the findings of the cone penetrometer pore pressure plots, confirming the presence of the semi-confining layer. Efforts to obtain groundwater samples using the direct-push sampler from within the clay and silt zone yielded no water, and the tool screen was found to be smeared with a plastic, clayey soil after attempts to obtain groundwater samples from the clay and silt zone. Also, the vertical distribution of chlorinated compounds detected in groundwater samples indicated contaminant concentrations orders of magnitude lower below the clay layer than above it, indicating that the clay layer is acting as an aquitard.

The IAS analyzed groundwater samples for picric acid (the form of ammonium picrate found in groundwater) and pH. Picric acid was not detected, and pH was within expected levels. The IAS concluded minimal probable impact from the explosives washout operation based on the presumption that material lost would have been lost as direct discharges to surface water and would no longer be present. The site was not recommended for a confirmation study.

During the Site Investigation, lead in the soil samples collected from the process leaching system tank was detected at concentrations greater than background but below screening guidance concentrations. The other metals were within normal background concentrations. Picric acid (the ammonium picrate analogue in soils) was detected in one sample. No other explosive compounds were detected. TCE was detected in one groundwater sample at an elevated concentration (660 ug/L). Other VOCs such as DCEs (related to TCE as impurities or breakdown products) were also present. The source of TCE was speculated to be

associated with the process leaching system of Building GB-1. Low concentrations of several explosive compounds were also detected in samples from two wells.

During the RI, TCE (up to 74.0 ug/kg) and 1,2-DCE (total) (up to 140 ug/kg) were detected in soil samples obtained near the process leach tank, at concentrations below the New Jersey Impact to Groundwater soil criteria (for TCE - 1,000 ug/kg and for 1,2-DCE [trans – 50,000 ug/kg, and cis- 1,000 ug/kg]). The concentrations of most metals in the subsurface soil samples were within the ranges of background samples. Antimony was detected at low concentrations, near the instrument detection limit, in two soil samples but was not found in background samples. Barium was detected in one sample at a concentration greater than the concentration range associated with background samples but below the corresponding regulatory screening guidance level.

Groundwater samples collected from monitoring wells and by direct-push groundwater sampling methods contained TCE, 1,2-DCE, and related compounds at significant concentrations in a wide plume (approximately 350 feet by 130 feet) southwest of Building GB-1. Based on vertical profile sampling, the semi-confining clay layer appears to have limited the vertical migration of TCE and related VOC compounds. The type of contaminants detected and the configuration of the plume implicate the process leach tank as the source of groundwater contamination.

Concentrations of most metals in the groundwater samples were within ranges similar to background samples. Zinc, barium, cadmium, and silver were detected in some groundwater samples at concentrations greater than the concentration range associated with background samples. However, soil sampling results showed no evidence of a source area of these contaminants, there is no evidence that these metals were used at significant concentrations or disposed of at the site, and detections of metals in groundwater were sporadic over time and by location. Explosives were analyzed for but not detected in groundwater samples, indicating that the one low level detection of picric acid found in soil during the previous investigation had no impact on groundwater and most likely was an isolated occurrence.

Figure 5-3 depicts groundwater sample locations with exceedences compared to applicable standards from the most recent sampling event. Table 5-1 summarizes the results of samples obtained from the groundwater monitoring wells during the RI (historical perspective) and long-term monitoring (current conditions) and compares them to applicable standards.

The HHRA concluded the cancer risks associated with future residential receptors exposed to groundwater exceeded 1 X 10^{-4}, the upper end of the target risk range, based mainly on ingestion of TCE and 1,1-DCE in groundwater and from inhalation of vapors while showering. Estimates for noncancer risks associated with future industrial and future residential groundwater exposure scenarios exceeded 1.0, the cutoff point below

which adverse noncarcinogenic effects are not expected to occur. VOCs (TCE and DCE) are the primary risk drivers. Lead concentrations detected at the site during the RI were significantly less than the USEPA soil exposure guidelines for children (400 ppm) and are not expected to be associated with a significant increase in blood-lead levels

The ERA indicated that Site 26 is relatively small and consists of turfgrass or developed areas such as open storage or vehicle parking areas that provide little ecological habitat. Wooded uplands are present northwest of the site. These upland areas provide excellent habitat for a wide variety of terrestrial organisms. No wetlands, other sensitive habitats, or threatened or endangered species of any kind exist in the vicinity of Site 26. The ERA concluded that no significant contaminant migration pathways to the upland habitats exist at the site. Water from the process leach tank area is not expected to migrate via overland runoff to the upland areas because the wooded areas are a few feet higher in elevation than the area next to Building GB-1. Groundwater discharge of contaminants to surface water is also insignificant because no wetlands or other surface water bodies are present near the site.

5.3 REMEDIAL ACTIONS

Based on the results of the RI/FS process, it was determined that a remedial action was necessary for Site 26. A ROD for Site 26 was signed in September 1998 (DON, 1998a). The following sections describe the process used to select and implement the appropriate remedial action for Site 26.

5.3.1 Remedy Selection

An FS for Site 26 (B&RE, 1997a) was completed in response to the recommendations of the RI (B&RE, 1996). The FS evaluated several remedial alternatives. Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soil or groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail.

The PP and ROD concluded AS/SVE, source removal, institutional controls, and long-term monitoring should be the preferred remedial alternative. The Navy, with the support of USEPA and in consultation with NJDEP, selected this alternative, presented it in the PP in December 1997, and formally selected it in the ROD signed in September 1998. This alternative includes a CEA (institutional controls) as required by the State groundwater quality protection criteria. The remedy addresses contaminated source materials (the process leach tank and associated soils that were excavated and disposed) and contaminated groundwater in the vicinity downgradient of the process leach tank. The CEA covers the area immediately adjacent to Site 26 to bar the use of groundwater during the remediation period.

Based on ARARs and risk assessment results, the following RAOs were selected for Site 26:

- Prevent potential human exposures to contaminated groundwater.
- Mitigate migration of VOC contaminants in groundwater and restore the aquifer to applicable standards.

The remedy selected for Site 26 will meet the RAOs. The selected remedy, as defined in the ROD, consisted of the following components:

- Excavate and dispose of the process leach tank system and adjacent contaminated soils. Removal of the suspected source area eliminates the potential for direct exposure.

- Treat residual soil and groundwater contamination through the use of AS/SVE to remove the larger portion of solvent compounds present to the physically limiting endpoint, followed by monitored natural attenuation and periodic reviews of progress. The AS/SVE system will achieve active removal of most of the contaminants from the soil and groundwater. Residual VOCs remaining after AS/SVE treatment reaches its physically limiting endpoint will naturally attenuate under anaerobic conditions.

- Institutional Controls - Institutional controls have been enacted to bar the use of groundwater during the remediation period. The institutional controls include establishment of a CEA immediately adjacent to and (approximately 800 to 1,000 feet) downgradient of the Site 26 plume area. Because site groundwater does not meet New Jersey groundwater quality standards, the CEA pursuant to N.J.A.C. 7:9-6 was established to provide the State official notice that the constituent standards will not be met for a specified duration and to make ensure use of groundwater in the affected area is suspended until standards are achieved.

- Groundwater Monitoring – Long-term, periodic monitoring is conducted to assess contaminant status and potential threats to human health and the environment. Long-term monitoring determines when criteria have been met and will also evaluate the effectiveness of the remedial action. The long-term, periodic monitoring program allows the Navy and the responsible agencies (USEPA and NJDEP) to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and review remediation progress.

Implementation of this remedial alternative complies with the ARARs identified in the FS. While the RAO for groundwater protection will not be immediately achieved, risks are reduced in relation to background by removal of source materials and initiation of active remediation of contaminants in groundwater using AS/SVE and by continued monitoring to evaluate contaminant trends. Long-term, periodic monitoring and analysis will help determine when this RAO would be achieved. The groundwater standards will eventually

be met, and the CEA in the area immediately adjacent and downgradient of the site will preclude use of site groundwater during the remediation period until the groundwater standards are achieved. This alternative is believed to provide the best balance of protection among the alternatives with respect to response criteria. It utilizes a proven technology that has shown encouraging results in similar situations.

The remedy selected for Site 26 satisfied the remedy selection requirements of CERCLA and the NCP. Based on available information, the Navy believes the remedy is protective of human health and the environment, complies with ARARs (statutory requirements of USEPA, the State, and the local community), and is cost-effective.

5.3.2 Remedy Implementation

The leaching system and associated sludge/soil immediately northwest of Building GB-1 were removed/remediated in 1998, as described in the Site 26 Close-Out Report (FWENC, 1998a). The Navy's RAC mobilized to the site to begin excavation activities in February 1998, and the removal was completed in March 1998. The former process leach tank was approximately 7 feet long by 7 feet wide by 5 feet deep. Soil in the area of the process leachate tank was excavated to a depth of 5 feet, and soil was removed up to approximately 4 feet surrounding the tank. Associated piping was removed up to the building and the remaining piping or drains in the building were plugged with grout. Several drums of hazardous sludge/soil were removed for disposal. Approximately 20 tons of soil and broken reinforced concrete and concrete block material were removed for disposal as hazardous waste off site. The area of excavation is shown in the Site 26 Close-Out Report. This part of the Site 26 remediation was completed in accordance with the ROD and approved was by the Navy, USEPA, and NJDEP. The excavation was backfilled with clean soil to surrounding grade.

The remedial design for Site 26 groundwater began in May 1999 with an AS/SVE pilot test. The pilot test results were documented for the Navy by FWENC in the June 14, 1999 submittal Air Sparge/Soil Vapor Extraction Pilot Test Report, Operable Unit No. 3: Site 26. The proposed design and construction details of the full-scale vapor extraction (AS/SVE) system were documented by the Navy in the September 24, 2000 Final Remedial Action Plan for Air Sparging/Soil Vapor Extraction, OU-3, Site 26 at Naval Weapons Station Earle. Addditional field work (e.g., field survey, geotechnical field investigation, geotechnical laboratory testing, and further groundwater monitoring) was conducted to collect the data necessary to install the AS/SVE system. The Navy conducted groundwater monitoring in March 2000 to confirm the magnitude and extent of the groundwater plume (TCE and DCE) because approximately 5 years had transpired since the RI and because there was a lack of measurable VOCs during the AS/SVE pilot test. During the March 2000 groundwater investigation, low concentrations of tetrachloroethene (PCE) in the groundwater were encountered. The March groundwater investigation was expanded to determine the extent of the apparent PCE plume. Based on the results of this groundwater investigation, the AS/SVE

system layout and design was revised to include AS/SVE wells to remediate the TCE/DCE and PCE groundwater plumes (FWENC, 2000b).

Construction of the AS/SVE was completed in December 2000 by the Navy's RAC and the system began remediation operation in early January 2001. The AS/SVE system is composed of a vapor extraction system (two blowers), an AS system (two blowers), a gas-phase granular activated carbon adsorption system (two units) to treat the captured gases, miscellaneous valves and pressure gauges, 72 sparge wells, 8 horizontal SVE wells, and 4 vertical SVE wells connected in an aboveground piping network.

The capital cost for implementation of the preferred remedial alternative was estimated at $1,698,000 in the ROD. This estimate included costs associated with site preparation, equipment purchase and erection, AS/SVE network installation, construction waste disposal, start-up of the AS/SVE system, and operations of the system. A revised estimate was prepared during the RD that included only construction costs, start-up costs and 1 month of operations. The revised estimated cost for implementation of the RD was approximately $872,000. The actual final capital cost for implementation of the RD was approximately $860,000. Savings were realized by using rotosonic drilling that resulted in no cuttings for disposal and an existing building (GB-1) was used instead of a prefabricated building to house the AS/SVE process equipment.

Annual average O&M costs were estimated at $499,000. This estimate included costs associated with equipment operations, sampling and analysis, utilities, labor, oversight, and periodic monitoring. Actual annual O&M costs are $157,000. Annual O&M costs have been lower than planned for several reasons. Due to the nature of Navy ordnance handling and storage operations in the vicinity of the site, the system is operated for 8 hours per day rather than the 24-hour operation planned. Remote operations of the system via phone line telemetry has reduced travel and labor expense to a level well below plan. Electricity to run the AS/SVE system is obtained directly (unmetered) from the Navy common supply at the nearest source so does not appear in annual costs.

To meet the institutional control requirements in the ROD, the Navy placed land use restrictions into the Base Master Plan to restrict use of contaminated groundwater at IR Site 26 at NWS Earle. Implementation of the CEA under NJDEP guidelines ensures that untreated groundwater beneath the site will not be used for a drinking water source.

Other components of the remedial action, including long-term groundwater monitoring and O&M, are discussed below in Section 5.3.3.

5.3.3 System Operations/Operation and Maintenance

The Navy contracted with the RAC, FWENC, to implement the installation, start-up, and O&M of the AS/SVE system. The start-up of the AS/SVE system occurred in early January 2001. The Navy began a monitoring program at Site 26 in March 2001. The Navy also contracted with FWENC to perform the long-term groundwater-monitoring program. The results of the program are being used to assess the effectiveness of the remedial action. Quarterly sampling has been completed at the site since the program was initiated in accordance with the Remedial Action Plan for Air Sparging/Soil Vapor Extraction, OU-3, Site 26 at NWS Earle (FWENC, 1999).

Five quarterly groundwater sampling events have been conducted between 2001 and 2002. The results from the quarterly groundwater sampling events were summarized in five separate quarterly monitoring reports to document the monitoring program (FWENC, 2002a, 2002b) and submitted to the USEPA and NJDEP for review and comment. The reports include an evaluation of the data collected under the program and provide a brief screening-level assessment of the data. The results of the program are discussed in Section 5.4.2.

The quarterly reports also include pre- (influent) and post- (effluent) air samples to evaluate the extraction of TCE and DCE from the groundwater and the loading of VOCs on the granular activated carbon units. The samples are collected monthly and sent to a laboratory for VOC analysis. The results of the this monitoring are discussed in Section 5.4.2

The average annual O&M costs including long-term monitoring of groundwater were estimated at $499,000 per year, and five-year reviews were estimated to cost $15,500 per event in the ROD. The actual annual cost for the long-term monitoring at Site 26 is approximately $157,000. This estimate includes the costs associated with sampling, analysis, validation, and reporting. The actual annual cost for the implementation has been less than anticipated, but the final cost has not yet been tabulated because the remedial actions are ongoing.

5.4 FIVE-YEAR REVIEW FINDINGS

5.4.1 Site Inspection

A site inspection was conducted at Site 26 in January 2003 and also during the long-term monitoring events. The inspection included visual observations of the area, the AS/SVE system, and the groundwater monitoring wells. Weather conditions during the inspection were favorable, with mild temperatures and no precipitation. A representative from TtNUS performed the inspection. Photographs taken during the site inspection are provided in Appendix A. A site inspection checklist was completed

during the inspection. The completed checklist is provided in Appendix B. The AS/SVE system was in operation and the groundwater monitoring wells were in good condition. No unusual observations were documented during the site visit.

The site inspection included visual observations of the current condition of Site 26. During the site inspection, the inspector found that the land use for the site has remained unchanged since the remedial action was completed. A fence topped with barbed wire, locked gates, and warning signs were observed during the inspection. These security features restrict access to authorized users only and ensure that the approved land use is not violated.

No deficiencies were noted in Site 26 remediation appurtenances or maintenance.

5.4.2 Document and Analytical Data Review

5.4.2.1 Document Review

The documents reviewed for the five-year review are listed below, and key information obtained from the documents is summarized in the following paragraphs.

- RI Report
- FS for Sites 4, 5, 19, and 26
- ROD, OU 3, Site 26
- Remedial Action Plan for Air Sparging/Soil Vapor Extraction for Site 26
- Site 26 Close-Out Report
- Groundwater Plume Delineation for Air Sparging/Soil Vapor Extraction Design
- (O&M Manual
- System Operation Reports for Air Sparging/Soil Vapor Extraction

A review of the RI, FS, and ROD for Site 26 provided the background for the site, RAOs, ARARs, and a description of the selected remedy for the site. The review also provided the cost estimate for the remedial alternative.

A review of the Final Remedial Action Plan for Air Sparging/Soil Vapor Extraction for Site 26 provided a discussion on the nature and extent of the plume, pilot test results, design and layout of the AS/SVE, AS/SVE operations and maintenance details, and regulatory compliance. The Remedial Action Plan also included a detailed cost estimate for completion of construction.

A review of the Site 26 Close-Out Report provided the details of the excavation and disposal activities. The report also summarized the confirmatory sampling performed during the removal action.

A review of the O&M Manual provided a description of AS/SVE system components, system operations, contingency planning, system maintenance, and routine sampling analysis and reporting.

A review of the System Operation Reports for Air Sparging/Soil Vapor Extraction for Site 26 provided an updated understanding of the site. The results of the groundwater monitoring were compared to historical data and were used to arrive at conclusions and recommendations for potential future actions at the site.

5.4.2.2 Data Review

The Navy implemented a monitoring program at Site 26 in March 2001. The results of the program are being used to assess the effectiveness of the remedial action. A summary of conclusions from the System Operation Report for Air Sparging/Soil Vapor Extraction (May 2002 through July 2002) for Site 26 is provided below. Table 5-1 summarizes the analytical data collected during the program. The chemicals provided in the table are the COPCs identified in the RI, FS, and ROD. The criteria used to screen the data are also provided in the table. The primary criteria are the NJDEP Cleanup Standards for Contaminated Sites. Figure 5-3 is a tag map showing data that exceeded applicable criteria.

Data from the most recent sampling event at Site 26 indicate that chlorinated hydrocarbon concentrations in groundwater have generally decreased in the area when compared to RI and previous monitoring sample results. Two compounds that exceeded the corresponding regulatory criterion in the RI, 1,1 DCE and 1,2 DCE (total), were not detected. TCE, which exceeded the regulatory criterion (1 ug/L) at a concentration of 1700 ug/L in the RI, was encountered at a substantially reduced concentration of 7.9 ug/L. Two other organic compounds, chloroform and PCE, encountered infrequently in the RI at levels near their respective regulatory criteria were found at slightly increased concentrations when compared to the RI results, but still near the regulatory levels.

The review of these documents indicates that the Navy is meeting the requirements of the ROD, and with these periodic monitoring events is re-evaluating the status of the remedial alternative as required by the ROD. The Navy should review the advisability of continued operation of the AS/SVE system and consider optimizing the monitoring frequency. Quarterly monitoring appears adequate; however, if low concentrations of chlorinated compounds continue to be encountered, the frequency could be decreased to annual or less.

5.4.3 ARAR and Site-Specific Action Level Changes

The remedial action implemented at Site 26 included excavation and off-site disposal of the contaminated soil, installation and operation of an AS/SVE system, institutional controls, and long-term monitoring. ARARs and TBCs were reviewed to determine whether there have been changes since the ROD was signed. Two ARARs that have changed for soils, NJDEP Soil Impact to Groundwater Criteria for TCE and 1,2 DCE, do not apply because the completed source removal remediated to concentrations less than the new criteria. Groundwater ARARs (chemical-specific, action-specific, and location-specific) have not changed since the signing of the ROD. Changes associated with monitoring are addressed in the response to Question 2 of Section 5.5, Assessment.

The ERA for Site 26 indicated the site is relatively small and consists of turfgrass or developed areas such as open storage or vehicle parking areas that provide little ecological habitat. Wooded uplands northwest of the site provide excellent habitat for a wide variety of terrestrial organisms. No wetlands, other sensitive habitats, or threatened or endangered species of any kind exist in the vicinity of Site 26. The ERA concluded that no significant contaminant migration pathways to the upland habitats exist at the site. The remedial action of excavation and off-site disposal of the contaminated soil implemented at Site 26 reduced the risks by eliminating the contaminant source. This reduced the threats to ecological receptors in the site vicinity. The confirmatory samples confirmed removal of impacted soil in compliance with applicable action criteria. Therefore, changes in the screening values since the completion of the ERA would not impact the effectiveness of the remedial action.

5.5 ASSESSMENT

The following conclusions support the determination that the remedy for Site 26 is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

- ***HASP/Contingency Plan:*** An active remediation and O&M program is being implemented at Site 26. The results of the program are being used to evaluate the removal action and the AS/SVE system performance. The data do not indicate any significant contaminant migration concerns. Should groundwater data indicate the need to evaluate additional remedial actions at some point in the future, the Navy and the regulatory agencies can reevaluate the remedial action at any time.

- ***Implementation of Institutional Controls and Other Measures:*** Institutional controls associated with Site 26 are being implemented in accordance with the CEA for Site 26. These controls meet the intent of the institutional controls RAO discussed in Section 5.3.1. At the time of the site inspection,

fencing and warning signs were in good repair. Monitoring wells outside of the fence appeared to be locked at all times except for periodic sampling. There was no evidence of unauthorized access.

- ***Remedial Action Performance:*** The removal action was completed at Site 26 and confirmatory samples confirmed removal of impacted soil in compliance with applicable action criteria. The removal action was effective in reducing unacceptable human health risks and threats to ecological receptors in the vicinity of Site 26. The AS/SVE system has been installed and is in operation. A long-term monitoring program is being implemented to evaluate the removal action and AS/SVE system operation performance. Proper O&M is necessary to evaluate the effectiveness of the remediation.

- ***System Operations/O&M:*** The removal action was completed in 1998 as intended, and the operation of the AS/SVE system and O&M (long-term monitoring) are being performed at the site. The fifth quarter monitoring report indicated that the O&M plan for the AS/SVE system is being followed.

- ***Cost of Operations/O&M:*** Actual costs for the current long-term monitoring program are approximately $157,000 per year.

- ***Opportunities for Optimization:*** The Navy should review the advisability of continued operation of the AS/SVE system and consider optimizing monitoring frequency. The frequency of sampling for the long-term monitoring program has been quarterly. If low concentrations of chlorinated compounds continue to be encountered, the frequency could be decreased to annual or less. The analytical parameter list for the groundwater monitoring program currently includes the TCL VOCs and could be reduced to the COPCs (PCE, TCE, chloroform and DCE or chlorinated hydrocarbons only).

- ***Early Indicators of Potential Remedy Failure:*** There were no deficiencies noted at this time.

Question 2. Are the assumptions used at the time of the remedy selection still valid?

- ***Changes in Standards and TBCs***: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the ROD was signed. As presented in Section 5.4.3, there have been minor changes to current ARARs. The changes in the Primary Drinking Water Standards and the NJDEP Cleanup Standards for Contaminated Sites do not impact the protectiveness of the remedy.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** There have been no changes in the human health toxicity criteria that will impact the primary or secondary monitoring criterion. Changes in toxicity factors have occurred for chloroform and vinyl chloride (cancer slope decrease); benzene and TCE (cancer slope increase); and manganese (RfD increase). Using the latest monitoring event data, the resulting lifetime resident cancer risk associated with TCE is 5×10^{-6} and that for benzene is 2×10^{-5}, both of which are near the lower end of the acceptable risk range. Both substances were detected at a lower concentration than the maximum concentrations in the RI, which offsets the fact that slope factors increased. HIs for the future residential exposure to groundwater are similar to those in the RI, with the change in manganese RfD not significantly changing the HI sum.

- ***Changes in Risk Assessment Methodologies:*** As discussed in Section 5.4, there have been no major changes in HHRA or ERA methodology since the signing of the ROD.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

5.6 DEFICIENCIES

No major deficiencies were identified during the five-year review of the site.

5.7 RECOMMENDATIONS AND REQUIRED ACTIONS

Based on the results of the site inspection and review, the following recommendations and actions are required for Site 26.

- Continue to conduct the long-term monitoring in accordance with the CEA documentation for Site 26.

- Review the advisability of continued operation of the AS/SVE system. Low levels of contaminant removal/recovery, coupled with low concentrations of contaminants found in groundwater, imply that the remediation physical limit endpoint of this technology at this site may have been met.

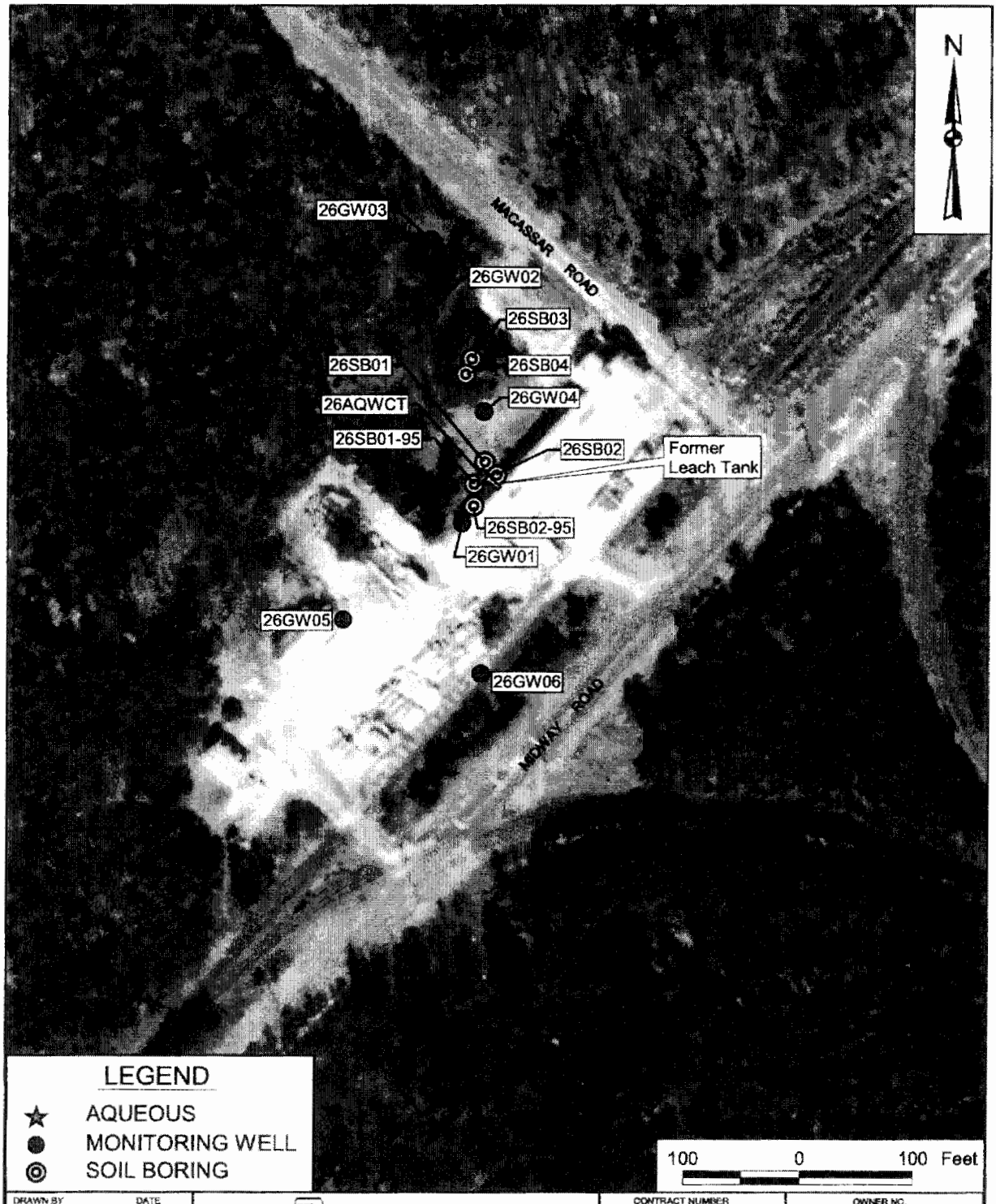
- Consider reducing the monitoring frequency. If low concentrations of chlorinated compounds continue to be encountered, the frequency could be decreased to annual or less.

5.8 PROTECTIVENESS STATEMENT

The remedy at Site 26 is currently protective of human health and the environment. The source of contamination has been removed thereby reducing the unacceptable human health risks and threats to ecological receptors in the vicinity of Site 26. No additional excavation at Site 26 is required.

An AS/SVE system has been installed and is operating in the chlorinated VOC plume identified at the site. A long-term monitoring program is being implemented to verify that the removal action and the AS/SVE system are performing as designed. The results of the monitoring program suggest that the removal action and the AS/SVE system is performing as planned. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The institutional controls, through the CEA, place restrictions on use of site groundwater.

The Navy, USEPA, and NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 26. Based on the completed activities and the activities that are underway or planned, the intent and goals of the ROD for Site 26 have or will be met.



DRAWN BY: LDL	DATE: 1/29/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER NO.: FIVE-YEAR REVIEW
CHECKED BY: RFD	DATE: 2/6/03	SITE PLAN OPERABLE UNIT 3, SITE 26 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle_5YearReview.apr LAYOUT: FIVE-YEAR REVIEW-SITE 26
COST/SCHEDULE-AREA			APPROVED BY: RET / DATE: 2/26/03
SCALE: AS NOTED			DRAWING NO.: FIGURE 5-1 / REV

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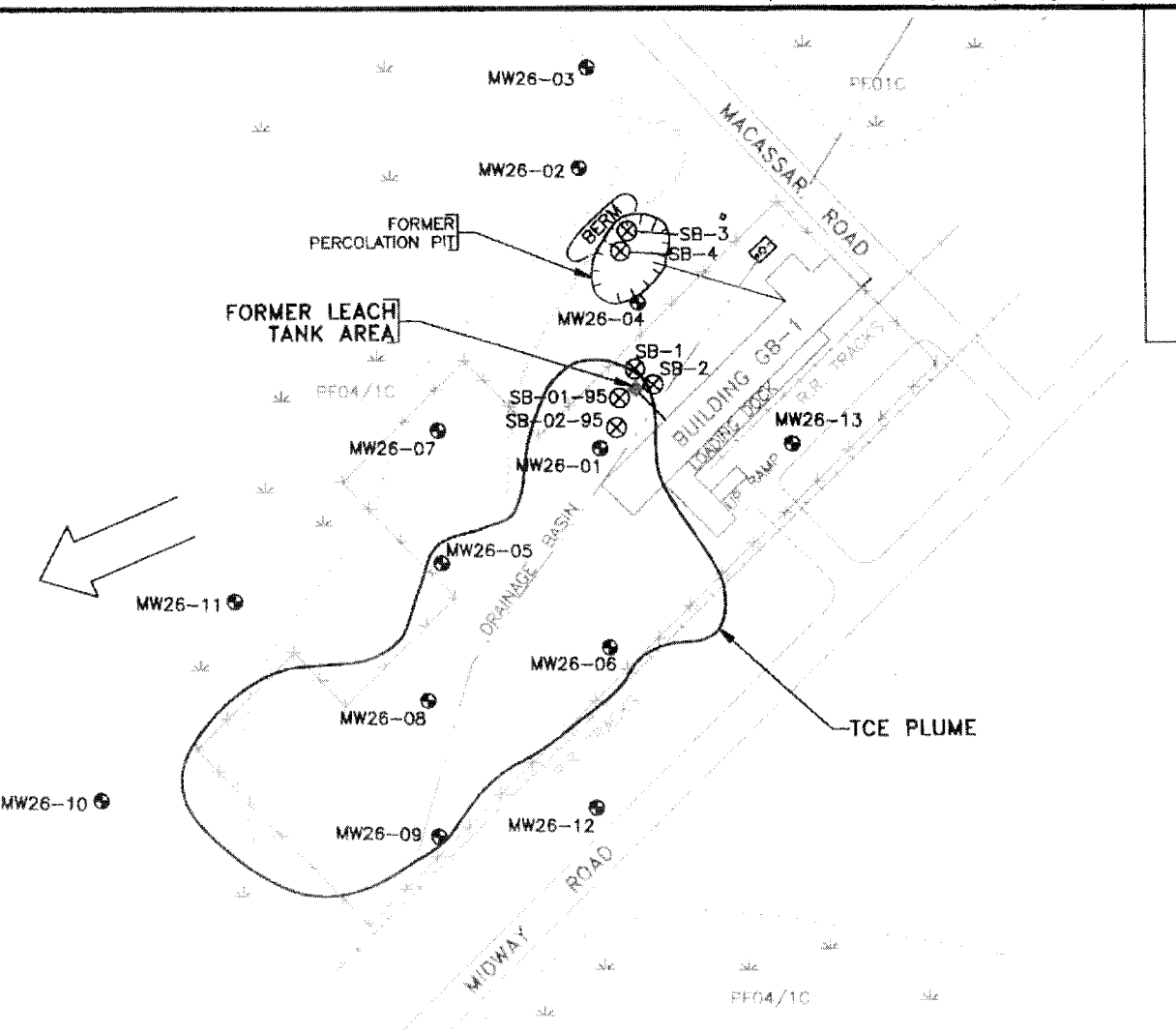
ACAD:2128/FIVE-YEAR REVIEW/2128cp07.dwg 2/19/03 LDL

LEGEND

- MONITORING WELL LOCATION
- SOIL BORING LOCATION
- GROUNDWATER FLOW DIRECTION
- WETLANDS
- WETLANDS DELINEATION SOURCE NJDEP
- DLG STREAM COVERAGE SOURCE: USGS RESTON, VA



NOTE:

MONITORING WELLS MW26-07 THROUGH MW26-18 ARE APPROXIMATE LOCATIONS.

0 100 200

SCALE IN FEET

TETRA TECH NUS, INC.

FORMER LEACH TANK EXCAVATION AREA AND TCE PLUME

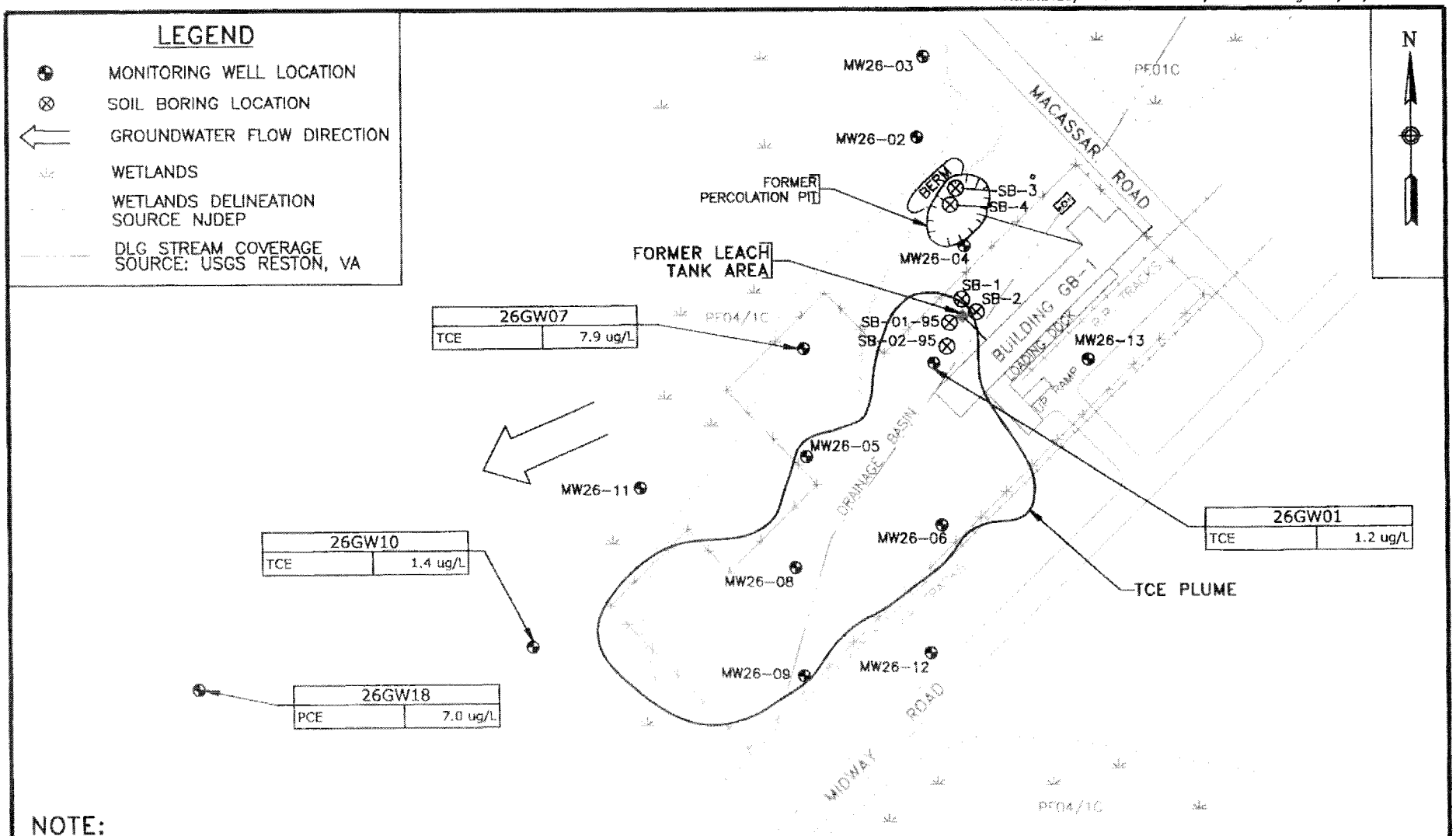
OPERABLE UNIT 3, SITE 26

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

SCALE	AS NOTED
FILE	2128cp07.dwg
	LDL PHL
REV	DATE 2/26/03
FIGURE NUMBER	FIGURE 5-2

ACAD:2128/FIVE-YEAR REVIEW/2128kt01.dwg 2/21/03 LDL



NOTE:

MONITORING WELLS MW26-07 THROUGH MW26-18 ARE APPROXIMATE LOCATIONS.

0 100 200

SCALE IN FEET

TETRA TECH NUS, INC.

GROUNDWATER CONCENTRATIONS ABOVE REGULATORY CRITERIA

OPERABLE UNIT 3, SITE 26

NAVAL WEAPONS STATION EARLE

COLTS NECK, NEW JERSEY

SCALE: AS NOTED

FILE: 2128kt01.dwg LDL PHL

REV: 21

DATE:

FIGURE NUMBER: FIGURE 5-3

TABLE 5-1

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN IN GROUNDWATER
OPERABLE UNIT 3, SITE 26
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Last Long-Term Monitoring Event[2]	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection[1]	Maximum Concentration	USEPA/NJDEP
VOLATILE ORGANIC COMPOUNDS (µg/L)						
1,1-DCE	1/6	3	ND		ND	7/2
1,2-DCE (total)	1/6	2000	ND		ND	70/10
Chloroform	1/6	1	6.8		ND	100/6
PCE	1/6	1	7		ND	5/1
TCE	2/6	1700	7.9		ND	5/1

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] July 24, 2002.

[3] USEPA Maximum Contaminant Level/NJDEP Ground Water Quality Standards N.J.A.C. 7:9-6.
Shading indicates that the value is greater than regulatory criteria.
ND = Not detected.

6.0 OPERABLE UNIT 6, SITE 3 – LANDFILL SOUTHWEST OF "F" GROUP

Site 3 under the Navy's IRP includes the Landfill Southwest of "F" Group. The landfill is a 5-acre site used from 1960 to 1968 for the disposal of domestic and industrial wastes. This five-year review of Site 3 is required by statute because hazardous substances, pollutants, or contaminants remain on site that do not allow for unlimited use or unrestricted exposure. The RD for a landfill cover was completed in 2001, and remedial action is currently in progress. Data collected during the remedial design are evaluated within this report.

6.1 HISTORY AND SITE CHRONOLOGY

A list of important Site 3 historical events and relevant dates in the site chronology is shown below. The identified events are illustrative, not comprehensive.

Event	Date
Landfill operations.	1960 to 1968
Final IAS completed.	1982
Phase I Site Inspection/IRP Phase II Confirmation Study completed.	1986
Phase II Site Inspection completed	1993
RI completed.	1996
RI Addendum completed	1998
FS completed.	1999
PP issued.	May 2001
Public Meeting.	May 2001
ROD signed.	Pending
RD completed.	September 2001
Letter of Approval for Engineering Remedies	July 2002
Remedial Action began.	September 2002

6.2 BACKGROUND

Site 3 is a 5-acre site used from 1960 to 1968 for the disposal of domestic and industrial wastes (Figure 6-1). Industrial wastes reportedly disposed at Site 3 consisted of paints and paint thinners, solvents, varnishes, shellac, acids, alcohols, caustics, pesticide containers and rinse water, wood, and small amounts of asbestos. Records show that the industrial wastes comprised a small portion of a total approximately 4,800 tons of waste in the landfill. A thin layer of sandy soil was placed as cover over the landfill contents.

Site 3 was characterized as an open area surrounded by woodlands. The site was moderately vegetated with grasses and scrub pines. There were several scarred areas with no vegetation in the northeastern

portion of the site. The ground surface was relatively flat, with ground elevations varying between 115 and 125 feet above msl. The site is bordered by a dirt road to the southeast and by railroad tracks to the northeast. A small forested wetland is located directly southeast of the former landfill, and runoff from most of the landfill flows toward the wetland.

Regional geological mapping identifies Site 3 as being within the outcrop area of the Kirkwood Formation. The Kirkwood Formation ranges between 60 and 100 feet in thickness. The lithology of the sediments encountered in the on-site borings generally agrees with the published description of the Kirkwood and Vincentown Formations. In general, the borings encountered white and yellowish-brown, very fine- to fine-grained sand with minor silt and clay layers, dark gray silt and clay (probably representative of the Kirkwood Formation) and glauconitic, medium- to coarse-grained sand (probably representative of the Vincentown Formation). Based on the boring log descriptions, wells MW3-02 through MW3-07 penetrated the Kirkwood Formation, and well MW3-01 penetrated the Kirkwood and Vincentown Formations.

Groundwater in the Kirkwood and Vincentown aquifer beneath the site occurs under unconfined conditions, and the formations are interpreted as being hydraulically connected. The direction of shallow groundwater flow in the aquifer, as indicated by August 1995 groundwater elevation data, is southeast toward the wetland. There appears to be a significant seasonal variation in the groundwater elevation; water levels could not be obtained in October 1995 because most of the wells were dry. The hydraulic conductivities calculated for MW3-03 and MW3-06, screened in the Kirkwood Formation, are 7.16×10^{-4} cm/sec (2.03 ft/day) and 5.50×10^{-4} cm/sec (1.56 ft/day), respectively from the RI.

The IAS determined that there was potential for groundwater impacts to the Kirkwood aquifer from the site and recommended further investigation. The Phase I Site Investigation groundwater samples were found to have a relatively low pH, but no compounds were detected in these samples at concentrations greater than regulatory limits at that time. No other Site 3 media were sampled in the Phase I Site Investigation.

During the Phase II Site Investigation, test pits were excavated to obtain a physical description of the waste materials, soil in contact with the waste was sampled from the test pits to obtain a representative characterization of the status of soil in the area, and additional groundwater samples were collected to monitor groundwater quality. The test pit excavations indicated that the landfill contained typical municipal waste. In two soil samples three SVOCs (fluoranthene, pyrene, and bis(2-ethylhexyl) phthalate) were detected at concentrations below the method detection limit, barium was detected at a concentration of 1,320 mg/kg, and TPH was detected at a concentration of 110 mg/kg. Trace concentrations of pesticides were detected in one soil sample.

In groundwater samples, elevated concentrations of VOCs and SVOCs were detected in some wells, particularly monitoring well MW3-04m which had acetone at 970 ug/L and xylene at 470 ug/L. Wells MW3-04 and MW3-05 had low concentrations of several pesticide compounds.

The RI investigation included sampling and analysis of surface soil/sediment in the wetlands southeast of the landfill and additional sampling and analysis of groundwater from monitoring wells. Concentrations of most metals in site-related sediment samples were similar to the range associated with background samples. Antimony, cadmium, and silver were detected in sediment samples at low concentrations near the instrument detection limit but were not detected in the background samples. Polynuclear aromatic hydrocarbons (PAHs), including benz(a)anthracene, benzo(a)pyrene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, fluoranthene, fluorene, and pyrene, were detected in sediment at concentrations two to three times above background concentrations. 4-4'-DDT was detected in the sediment sample at concentration of 4 ug/kg; however, background concentrations as high as 19 ug/kg were detected. Alpha-BHC and heptachlor epoxide were detected in one sediment sample at 0.082 ug/kg and 2.2 ug/kg, respectively.

VOCs detected above the NJDEP criteria in groundwater in 1991 could not be replicated. 2-Butanone (5 ug/L) and gamma-chlordane (0.0081 ug/L) were each detected in one groundwater sample collected at Site 3. Acetone and xylene were detected in one well at concentrations greater than the NJDEP criteria. None of these compounds were detected in background groundwater samples. The highest concentrations of metals in Site 3 groundwater samples were detected in the sample collected at 03 GW 01. This well and one other (03 GW 03) required sample filtering in the field. The filtered sample from the downgradient location, 03 GW 01, exhibited fairly high aluminum concentrations (5,520 ug/L) and also displayed concentrations greater than background ranges for antimony and cadmium. Other metals such as iron, zinc, and barium were present at considerably lower concentrations in the filtered sample. Arsenic was present in the unfiltered sample at the slightly elevated concentration of 0.0151 mg/L, but was 0.0045 mg/L in the filtered sample. Sample 03 GW 05, collected from a well cross-gradient from the landfill, displayed an elevated concentration of manganese, and sample 03 GW 06 (an upgradient location) exhibited thallium at a low concentration. Figure 6-2 depicts sample locations with exceedences compared to applicable standards based on the most recent sampling event. Table 6-1 summarizes the results of samples obtained from the groundwater monitoring wells compared to applicable standards.

Based on the results of previous investigations and the RI, it was concluded that further sampling to delineate the extent of contamination in the wetlands adjacent to the site, particularly in the drainage pathway to the southeast, was required to evaluate potential impacts on ecological receptors. Additional sampling and analysis at Site 3 in 1997 included collection of surface soil and sediment for the RI Addendum report (B&RE 1998). The concentrations of PAHs in the sediment samples were within the ranges of background concentrations [benzo(a)anthracene, 68.0 to 93.0 ug/kg; benzo(a)pyrene, 81.0 to

97.0 ug/kg; benzo(b)fluoranthene, 110 to 120 ug/kg; benzo(k)fluoranthene, 50 ug/kg; chrysene, 130 to 140 ug/kg; fluoranthene, 160 to 190 ug/kg; phenanthrene, 180 to 220 ug/kg; and pyrene, 190 to 230 ug/kg]. One pesticide was detected in a sediment sample at a low concentration (4-4'-DDT, 3.0 ug/kg). The concentrations of metals in surface soils were similar to the ranges found in background samples.

In summary, results of investigations at Site 3 indicate that:

- Organic compounds (xylene and acetone) found in early groundwater investigations at concentrations above regulatory guidelines were not encountered in subsequent investigations. Considering the large amount of data collected over the years, there does not appear to be any trend to suggest that a concentrated VOC source remains undiscovered at the Site 3 landfill.

- Metals found in groundwater at concentrations above regulatory criteria include aluminum, antimony, arsenic, cadmium, and iron.

- Filtered groundwater samples indicated several metals present in suspension rather than in the dissolved phase, which would diminish the potential for long-range transport of these metals in groundwater. However, the filtered sample collected from the downgradient well also exhibited cadmium and aluminum at concentrations greater than background, which suggests their presence in solution.

- Detected chemicals in the groundwater do not conclusively demonstrate groundwater impact or identify a particular source location.

- One sediment sample from the drainage area downgradient of Site 3 contained PAHs and metals at concentrations greater than both the upstream samples and downstream samples and greater than the USEPA and NJDEP reference criteria. These chemical constituents have low potential for impact to groundwater. Runoff and erosional dispersion may allow limited migration of the contaminated sediments.

The HHRA concluded the reasonable maximum exposure (RME) scenario cancer risks associated with future residential and future industrial exposure scenarios did not exceed the upper end of the conservative USEPA guidance target risk range. The RME estimates for noncarcinogenic HIs associated with the future residential groundwater exposure scenario exceeded 1.0, the cutoff point below which adverse noncarcinogenic effects are not expected to occur. Arsenic is the COPC that exceeded 1.0 for this exposure scenario. In addition, central tendency exposure (CTE) scenario risk estimates for future residential exposure to groundwater yielded an HI greater than 1.0; the affected target organ is the skin.

Lead groundwater concentrations at the site were below the USEPA action level for public water supplies and are not expected to be associated with a significant increase in blood-lead levels based on the results of the Integrated Exposure Biokinetic (IEUBK) Lead Model (USEPA, 1994a).

The ERA chose an assessment endpoint for Site 3 as the protection of organisms inhabiting the wetland area because the habitat on the landfill is somewhat limited and of marginal quality. Concentrations of several PAHs and metals were detected in wetland sediments exceeding the ERA screening values. These PAHs and metals were either not detected or were detected at relatively low concentrations in groundwater, suggesting that contaminants may be migrating from the former landfill to the wetlands via overland runoff/erosion. In the landfill surface soil samples collected at the landfill toe, concentrations of the contaminants were relatively low. The ERA concluded that the impacts to the wetlands appear to be minor, and potential ecological risks to wetland receptors appear to be insignificant. Therefore, no remedial action based on potential risks to ecological receptors or additional ecological study was recommended at Site 3.

6.3 REMEDIAL ACTIONS

Based on the results of the RI/FS process, it was determined that a remedial action was necessary for Site 3. A ROD for Site 3 will be signed pending resolution of Department of Defense (DoD)/USEPA negotiations regarding land use controls. The following sections describe the process used to select and implement the appropriate remedial action for Site 3. A USEPA letter dated July 22, 2002 (see Appendix D) approved the Navy's proposed engineering remedy for landfill caps at Sites 3 and 10.

6.3.1 Remedy Selection

An FS for Site 3 (TtNUS, 1999) was completed in response to the recommendations of the RI and RI Addendum (B&RE, 1996; 1998). The FS evaluated several remedial alternatives. In the case of former landfill sites like Site 3, USEPA has undertaken the presumptive remedies initiative to speed up selection of remedial actions. Based on the expectation that containment would generally be appropriate for municipal landfill waste (such as that found at Site 3) and because the volume and heterogeneity of the waste generally make treatment impracticable, USEPA established containment as the presumptive remedy. Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soils, sediments, or groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail.

The PP and ROD concluded that limited action, soil cover, grading, institutional controls, and long-term monitoring should be the preferred remedial alternative. The Navy, with the support of USEPA and in consultation with NJDEP, has selected this alternative, presented it in the PP in May 2001, and formally selected it in the ROD that will be signed pending resolution of DoD/USEPA negotiation regarding land use controls. This alternative is in compliance with the USEPA presumptive remedy and includes a CEA as required by the State groundwater quality protection criteria. The CEA (institutional controls) will cover the area affected by the landfill. The soil cover, grading, and vegetation will be placed over the former landfill to reduce infiltration, promote drainage, limit erosion, and preclude potential contact with the landfill contents. This alternative of containment, access restrictions, and institutional controls will limit exposures to site contaminants and is protective of human health and the environment. The institutional controls would reduce human health risks posed by contact with landfill contents and would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future.

Based on ARARs and risk assessment results, the following RAOs were selected for Site 3:

- Prevent potential human exposure to metals in groundwater
- Prevent potential contact with landfill contents
- Minimize migration of landfill contaminants to the adjacent wetlands

The remedy selected for Site 3 will meet the RAOs. The selected remedy is a containment option, as defined in the ROD, consisting of the following components:

- Institutional Controls - Institutional controls such as access restrictions will be attached to the Station Master Plan to limit future uses of the site and to prevent disturbance of the soil cover or direct contact with contaminated media. A cable-type fence with appropriate warning signs will be erected around the landfill to limit access to the site, to restrict human contact with contaminated landfill materials, and to protect the integrity of the soil cover. A CEA pursuant to N.J.A.C 7:9-6 will be established to provide the State official notice that the constituent standards will not be met for a specified duration and to ensure that use of groundwater in the affected area is prohibited. The institutional controls will prevent potential human exposure to landfilled materials and will ensure maintenance of cap integrity, worker protection, and other considerations. Fencing and access restrictions will provide additional long-term protection by limiting access to the capped area and restricting future activities that could damage or intrude into the cover system. Restricted activities will include excavation and vehicular traffic (e.g., off-road vehicles and dirt bikes).

- Landfill Cover System – Additional soil cover, grading, and vegetation will be placed over the former landfill to reduce infiltration (reduce contaminant leaching to groundwater), promote drainage, limit erosion, and preclude potential contact with the landfill contents. The addition of soil and grading of the improved landfill cover will comply with federal and State municipal landfill closure and post-closure regulations. After construction, the cap will be maintained as needed.

- Groundwater Monitoring – Long-term, periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Because wastes will be left in place, site conditions and risks will be reviewed every 5 years. The long-term, periodic monitoring program would allow the responsible agency to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. Over time, the contaminants in groundwater will likely attenuate naturally through physical and chemical processes and concentrations in groundwater will decrease as a result of reduced infiltration of precipitation through landfill materials.

By regrading the landfill surface to preclude erosion, placing a cover over the landfill surface to avoid potential direct contact with landfill contents, and establishing a formal CEA to bar the use of site groundwater during the remediation period, the Navy will reduce the unacceptable risks associated with Site 3. This alternative is believed to provide the best balance of protection among the alternatives with respect to response criteria. While the RAO for groundwater protection would not be immediately achieved, risks would be reduced in relation to background by the elimination of infiltration and continued monitoring to evaluate contaminant trends. Long-term, periodic monitoring and analysis would determine when this RAO would be achieved.

The remedy selected for Site 3 satisfies the remedy selection requirements of CERCLA and the NCP. Based on available information, the Navy, USEPA, and NJDEP believe the remedy is protective of human health and the environment, complies with ARARs (statutory requirements of USEPA, the State, and the local community), and is cost-effective.

6.3.2 Remedy Implementation

The RD for Site 3 was completed for the Navy by a contractor in September 2001 (FWENC, 2001). Additional field work (e.g., field survey, geotechnical field investigation, and geotechnical laboratory testing program) was conducted to collect the data necessary to complete the design.

The cover system developed during the design included the removal of exposed debris and remnants of a former skeet range and placement of additional cover material to grade the site to encourage runoff. Grading of the landfill area was completed without removal of site vegetation, where possible.

Compaction of the soils and landfill materials was performed as needed. The appropriate slopes for the cover (to facilitate drainage) were determined as part of the cover system design. The final surface slope of landfill cover has a slope of between three percent (3V:1OOH) and 5 percent (5V:1OOH) for slope stability, to control erosion, and to allow compaction, seeding, and revegetation of the cover materials. The final slope also promotes precipitation runoff while inhibiting erosion or infiltration.

Minor modifications to the cover system design were made as a result of normal refinement of details during the implementation. The components of the final cover system were as follows:

- Top Layer – Placement of 6 inches of topsoil to support final seeding and vegetation.

- Soil Layer – Placement and compaction of 30 inches of cover soil material

- Landfill Subgrade Preparation/Excavation – Preparation of existing landfill subgrade materials (placement of fill and compaction operations within the limits of the existing landfill) to achieve the subgrade elevation in the design drawings.

- Storm Water Management Measures – Include culverts and drainage structures according to the design for sediment and erosion control.

- Vegetative Cover – The final graded cover will be prepared and hydroseeded according to the design.

The Navy's RAC mobilized to the site to begin preliminary construction activities in September 24, 2002, and the remedial action is currently ongoing. The expected completion data of the remedial action is June 2003. Details regarding the remedial action will be summarized in the final report for the remedial action or a close-out report.

To ensure of the quality of the remedial action, quality control testing and inspection were completed during the remedial action in accordance with the CQC Plan and the MQA /CQA Plan.

The capital costs for implementation of the preferred remedial alternative were estimated in the ROD at $1, 072,000 for site 10 and $878,000 for site 3 for a total $1,950,000. This estimate included costs associated with site preparation, site grading, soil cover placement, and security fencing. The actual cost for the implementation of the RD has not yet been tabulated because the remedial actions are ongoing. Actual award was $2,446,500 for both sites.

To meet the institutional control requirements in the ROD, the Navy will place land use restrictions into the Base Master Plan to for IR Site 3 at NWS Earle. The land use restrictions define access limitations precluding actions that could result in ground surface disturbance of soils or any subsurface disturbance that could result in damage to the landfill cover. Implementation of the CEA under NJDEP guidelines ensures that untreated groundwater beneath the site will not be used for a drinking water source.

Other components of the remedial action, including long-term groundwater monitoring and O&M, are discussed below in Section 6.3.3.

6.3.3 System Operations/Operations and Maintenance

The Navy will implement a monitoring program at Site 3 after the remedial action is completed to assess the effectiveness of the remedial action. Sampling will be completed at the site on an annual basis in accordance with an O&M manual that will be developed. Monitoring reports will be prepared to document the results of the monitoring program and will be submitted to the USEPA and NJDEP for review and comment. The annual reports will include an evaluation of the data collected under the program and provide a brief screening-level assessment of the data.

The average annual O&M costs (includes long-term monitoring, mowing, cover and fence repairs, etc.) are estimated at $17,500 per year for 30 years, and five-year review costs are estimated at $15,500 per event in the ROD. The actual costs for the implementation of maintenance and periodic monitoring have not yet been tabulated because remediation construction is not complete.

6.4 FIVE-YEAR REVIEW FINDINGS

6.4.1 Site Inspection

A site inspection was conducted at Site 3 in January 2003. The focus of the inspection at Site 3 was the status of cover system installation. Weather conditions during the inspection were favorable, with mild temperatures and no precipitation. A representative from TtNUS performed the inspection. Photographs taken of the site during the site inspection are provided in Appendix A. A site inspection checklist was completed during the inspection. The completed checklist is provided in Appendix B.

The site inspection included visual observations of the current construction of the cover system at Site 3. During the site inspection, the inspector found that the land use for the site has remained unchanged since the ROD was completed and that landfill cover installation was substantially complete. Warning signs and fencing were not yet in place at the site. Implementation of land use controls, including

enacting the CEA and placing limits on land use in the NWS Earle Base Master Plan, were not yet completed.

6.4.2 Document and Analytical Data Review

The documents reviewed for the five-year review are listed below, and key information obtained from the documents is summarized in the following paragraphs.

- RI Report
- RI Addendum Report
- FS for Sites 3 and 10 (OU -6)
- ROD, OU 6, Sites 3 and 10
- Proposed Plan for OU 6
- Remedial Action Work Plan (Remedial Design Report) for Site 3

A review of the RI, FS, and ROD for Site 3 provided the background for the site, RAOs, ARARs, and a description of the selected remedy for the site. The review also provided the cost estimate for the remedial alternative.

A review of the Remedial Design Report for Site 3 provided the details of the design of the cover system and included the final cover components.

The Operations and Maintenance Manual for the Site 3 (when it is prepared) will provide the monitoring well network to be used for the long-term groundwater monitoring program. The plan will also detail the analytical program, monitoring criteria, and data evaluation approach.

6.4.3 ARAR and Site-Specific Action Level Changes

The remedial action implemented at Site 3 includes a cover system, institutional controls, long-term monitoring, and O&M. ARARs and TBCs were reviewed to determine whether there have been changes since the ROD was prepared. The chemical-specific, location-specific, and action-specific ARARs, advisories, and guidance values (TBCs) that have changed are provided in the table below. No changes associated with monitoring are applicable because the long-term monitoring plan has yet to be prepared.

The ERA for Site 3 concluded that impacts to the wetlands appear to be minor, and potential ecological risks to wetland receptors appear to be insignificant. The site is currently in the process of being capped which will further eliminate the exposure pathway. Therefore, changes in the screening values since the completion of the ERA should not impact the effectiveness of the remedial action.

Contaminant	ARAR/Site-Specific Level		Source
GROUNDWATER			
Arsenic	Previous	50 µg/L	Primary Drinking Water Standard
	Previous	8 µg/L	NJDEP Groundwater Quality Standard
	New	10 µg/L	Primary Drinking Water Standard

6.5 ASSESSMENT

The following conclusions support the determination that the remedy for Site 3 is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

- ***HASP/Contingency Plan:*** An O&M program will be implemented at Site 3 upon completion of the construction of the cap system. The results of the program will be used to evaluate the cap's performance regarding minimizing contaminant migration. Should groundwater data indicate a need to evaluate additional remedial actions at some point in the future, the Navy will perform the evaluation at that time.

- ***Implementation of Institutional Controls and Other Measures:*** Institutional controls associated with Site 3 are being implemented in accordance with the ROD. Upon completion of the construction of the cover system, fencing will be placed around the site, and signs will be posted at the site entrances to warn that access is only for authorized users, that a cap is in place, and that no digging is allowed. These controls meet the intent of the institutional controls RAO discussed in Section 6.3.1.

- ***Remedial Action Performance:*** A cover system is being installed at Site 3. This cover will be effective in limiting direct exposure to contaminated soil or landfill contents and minimize contaminant migration from the site. A long-term monitoring program will be implemented to evaluate the cover's performance. Proper O&M will be necessary to maintain proper long-term performance of the cover system.

- ***System Operations/O&M:*** Installation of the cap system will be completed in June 2003. At that time, the system will be functioning as intended. An O&M plan will be developed and implemented.

- ***Cost of Operations/O&M:*** No actual costs for the groundwater monitoring program are available at this time. No actual O&M costs for the cap system are available at this time.

- ***Opportunities for Optimization:*** No opportunities for optimization are available at this time because O&M activities have not been implemented. After completion of the cover system and initiation of the groundwater monitoring program, the frequency of sampling for the long-term monitoring program should be reviewed and optimized as needed. The analytical parameter list for the groundwater monitoring program should be reviewed and optimized. Changes to the long-term monitoring program may be implemented as early as after the first year of monitoring.

- ***Early Indicators of Potential Remedy Failure:*** There were no deficiencies noted at this time. .

Question 2. Are the assumptions used at the time of the remedy selection still valid?

- ***Changes in Standards and TBCs***: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the ROD was prepared. As presented in Section 6.4.3, there have been minor changes to currently relevant ARARs. The changes in the Primary Drinking Water Standards and the NJDEP Cleanup Standards for Contaminated Sites do not impact the protectiveness of the remedy.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** There have been no changes in the human health toxicity criteria that will impact the primary or secondary monitoring criterion. A change in the toxicity factor has occurred for manganese (RfD increase). However, toxicity factors for several other COPC metals have not changed and because long-term monitoring has not yet begun at the site, the change in manganese the RfD would not significantly change the HI sum compared to the HI reported in the RI.

- ***Changes in Risk Assessment Methodologies:*** As discussed in Section 1.4, there have been no major changes in HHRA or ERA methodology since preparation of the ROD.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

6.6 DEFICIENCIES

No major deficiencies were identified during the five-year review of the site.

6.7 RECOMMENDATIONS AND REQUIRED ACTIONS

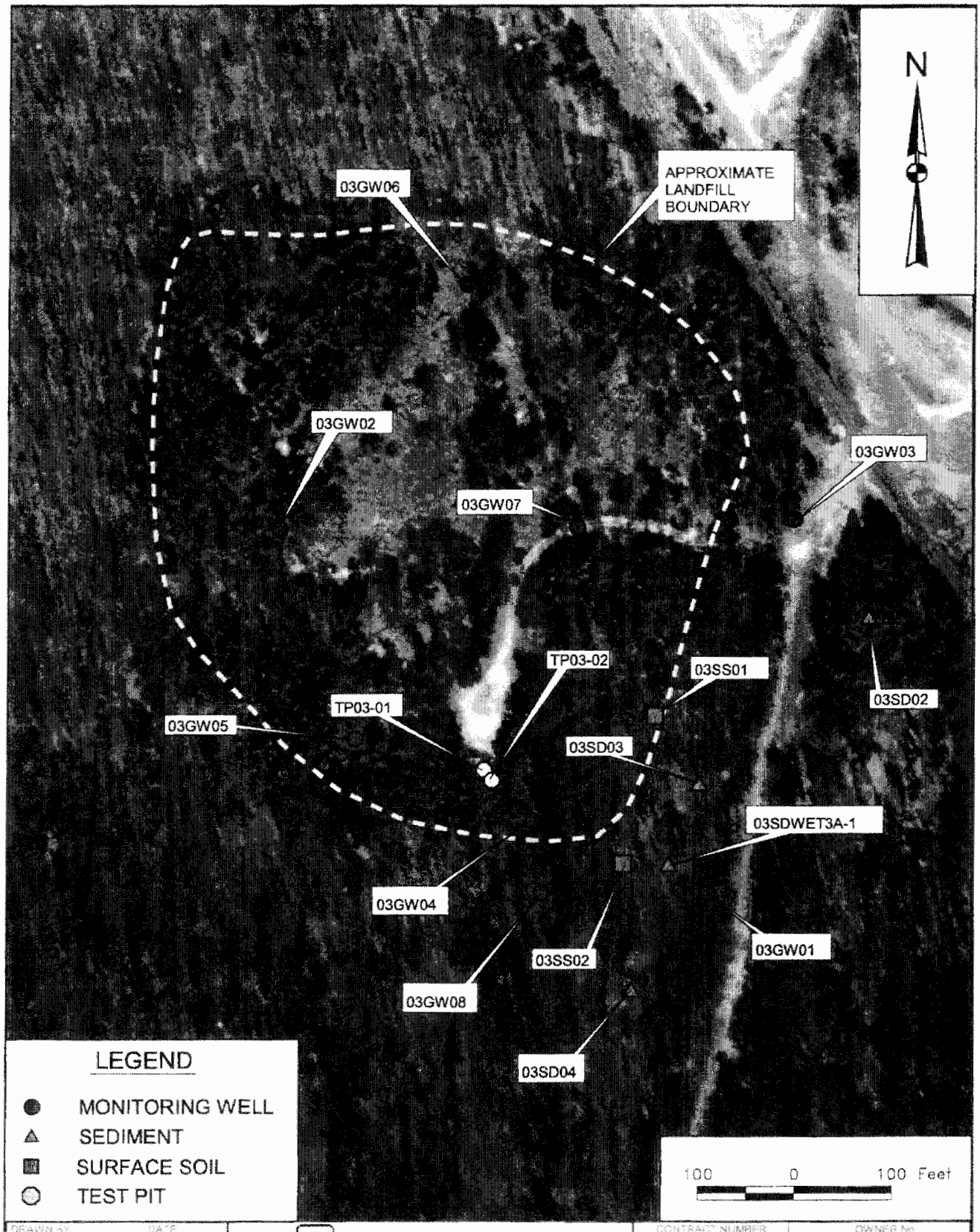
Based on the results of the site inspection and review, the following recommendations and actions are required for Site 3.

- Complete the installation of the engineered landfill cap system as designed.
- Prepare an O&M Manual.
- Begin the long-term monitoring in accordance with the O&M Manual.
- Consider optimizing the sampling frequency and analytical parameter list after the long-term monitoring program has been implemented.
- Restrict access to the site.

6.8 PROTECTIVENESS STATEMENT

The remedy at Site 3 is expected to be protective of human health and the environment upon completion. The source of contamination is contained and in the interim, the exposure pathways that could result in unacceptable risks are being controlled. The cover system will minimize infiltration and subsequent contaminant migration and prevent direct contact with soil and contaminated landfill materials. The long-term monitoring program will be implemented to verify that the cap is performing as designed. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The institutional controls, through the CEA, place restrictions on use of site groundwater.

The Navy, USEPA, and NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 3. Based on the completed activities and the activities that are underway or planned, the intent and goals of the ROD for Site 3 have or will be met.



DRAWN BY: LDL	DATE: 1/17/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER No: FIVE-YEAR REVIEW
CHECKED BY: RFD	DATE: 2/6/03	SITE PLAN OPERABLE UNIT 6, SITE 3 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle-1-PHL.apr LAYOUT: FIVE-YEAR REVIEW-SITE 3
COST/SCHEDULE AREA			APPROVED BY: RET / DATE: 2/26/03
SCALE: AS NOTED			DRAWING No.: FIGURE 6-1 / REV

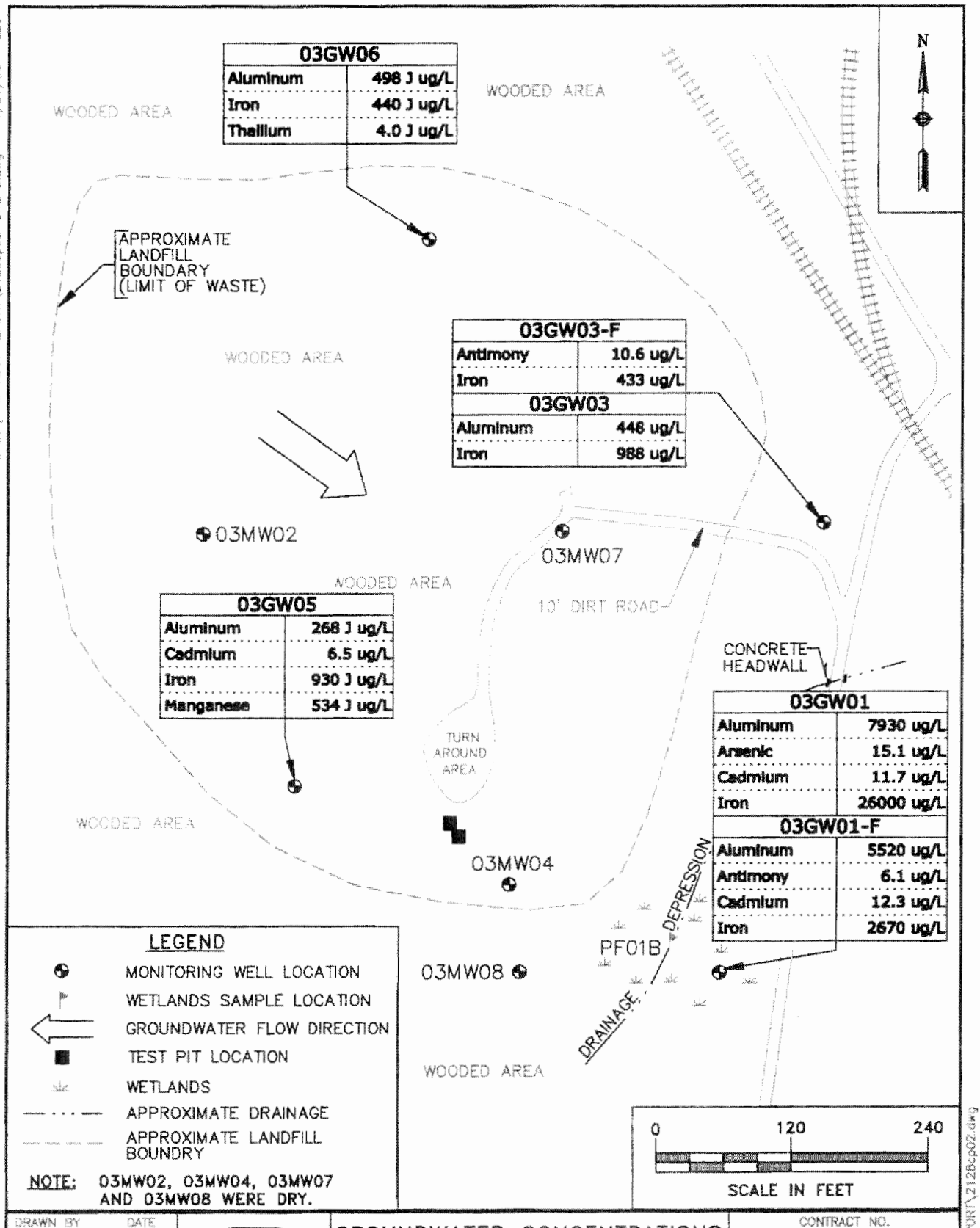


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TABLE 6-1

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN
OPERABLE UNIT 6, SITE 3
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Last Long-Term Monitoring Event	Background		Regulatory Criteria[3]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection	Maximum Concentration	USEPA/NJDEP
INORGANICS (µg/L)						
Aluminum	4/4	7930	NA[2]	4/4	2030	NS/200
Antimony	2/4	10.6	NA	-	-	6/20
Arsenic	1/4	15.1	NA	0/4	ND	10/8
Barium	4/4	689	NA	4/4	78.1	2000/2000
Cadmium	3/4	11.7	NA	1/4	0.51	5/4
Copper	4/4	16.3	NA	1/4	1.3	1300/1000
Iron	4/4	26000	NA	4/4	4600	NS/300
Lead	1/4	5.1	NA	1/4	2.3	15/10
Manganese	4/4	534	NA	4/4	720	NS/50
Mercury	4/4	0.12	NA	4/4	0.077	2/2
Nickel	4/4	22.7	NA	4/4	11.3	100/100
Thallium	1/4	4	NA	0/4	ND	2/10
Zinc	3/4	623	NA	4/4	30.9	NS/5000

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] Not applicable. Long-term monitoring has not begun at the site.

[3] USEPA Maximum Contaminant Level/NJDEP Ground Water Quality Standards N.J.A.C. 7:9-6.

Shading indicates that the value is greater than regulatory criteria.

ND = Not detected.

NS = No standard.

7.0 OPERABLE UNIT 6, SITE 10 – SCRAP METAL LANDFILL

Site 10 under the Navy's IRP, the Scrap Metal Landfill, is a 2-acre site used from 1953 to 1965 for the disposal of demilitarized munitions and spent munitions. This five-year review of Site 10 is required by statute because hazardous substances, pollutants, or contaminants remain on site at concentrations that do not allow for unlimited use or unrestricted exposure. The RD for the landfill cap was completed in 2001, and remedial action is currently in progress. Data collected during the RD are evaluated within this report.

7.1 HISTORY AND SITE CHRONOLOGY

A list of important Site 10 historical events and relevant dates in the site chronology is shown below. The identified events are illustrative, not comprehensive.

Event	Date
Landfill operations.	1953 to 1965
Final IAS completed.	1982
Phase I Site Inspection/IRP Phase II Confirmation Study completed.	1986
Phase II Site Inspection completed	1993
RI completed.	1996
FS completed.	1999
PP issued.	May 2001
Public Meeting.	May 2001
ROD signed.	Pending
Remedial Design completed.	September 2001
Letter of Approval for Engineering Remedies	July 2002
Remedial Action began.	September 2002

7.2 BACKGROUND

Site 10 is a 2-acre site used from 1953 to 1965 for the disposal of demilitarized munitions and spent munitions cased (Figure 7-1). The disposed material consisted primarily of spent metal munitions casings and aluminum and steel containers. Spent grit and paint chips from the ammunition re-work operations were also buried at the site. An estimated 65,000 cubic yards of material, including cover material, were disposed at the site. The landfill was covered with a sandy soil and was not closed with an impermeable cap. By the time of the RI, the cover material had eroded and 40-mm shell cases had been uncovered.

Site 10 was an open area surrounded by wetlands accessed via a dirt road from the south and was bordered by railroad tracks to the southeast, a wetland to the north, and a drainage ditch to the east. The

site was vegetated with grasses and pines, except for the access road and an open area (vehicle turn-around area) in the middle where no vegetation existed. The ground surface was relatively flat, with an average elevation of approximately 110 feet above msl.

Regional geologic mapping identifies Site 10 as being within the outcrop area of the Kirkwood Formation; upper colluvium may also be present at the site. The Kirkwood Formation ranges between 60 and 100 feet in thickness, and the upper colluvium has a maximum thickness of 10 feet. The lithology of the soils encountered in the on-site borings generally agrees with the published descriptions of the upper colluvium and the Kirkwood and Vincentown Formations. The on-site borings were no greater than 27.5 feet deep. Based upon the boring log descriptions, wells MW10-05 and MW10-07 penetrated the upper colluvium, Kirkwood Formation, and Vincentown Formation, and wells MW10-01 through MW10-04 and MW10-06 penetrated the Kirkwood and Vincentown Formations.

Groundwater in the upper colluvium, Kirkwood, and Vincentown aquifer beneath the site occurs under unconfined conditions, and the formations are interpreted to be hydraulically interconnected. The direction of shallow groundwater flow in the aquifer is northwest, north, and northeast, as indicated by the August and October 1995 groundwater elevations. There does not appear to be a significant seasonal variation in the groundwater elevation. The hydraulic conductivities calculated for MW10-04 (Kirkwood and Vincentown Formation), MW10-05 (upper colluvium, Kirkwood Formation, and Vincentown Formation), and MW10-07 (upper colluvium, Kirkwood Formation, and Vincentown Formation) are 2.54×10^{-4} cm/sec (0.72 ft/day), 6.99×10^{-4} cm/sec (1.98 ft/day), and 1.75×10^{-3} cm/sec (4.97 ft/day), respectively from the RI.

The IAS concluded that materials present in the landfill were inert or not leaching due to the moderate range of pH values in the soil environment. Erosion of the very thin cover material was noted, along with the exposed corroded shell casings. The Phase I Site Investigation included collection of groundwater and surface water samples. Methylene chloride (a possible laboratory artifact) was detected in the groundwater samples. One metal and one SVOC were detected in surface water samples.

During the Phase II Site Investigation, test pits were excavated to obtain a physical description of the waste materials, a soil sample was collected from the test pit, additional groundwater samples were collected to monitor groundwater quality, and surface water and sediment samples were collected to determine if the landfill has impacted the surrounding wetlands. Waste was encountered in two of the four test pits. A layer of decomposed natural organic material (i.e., leaf, root, and organic silty matter) was encountered in the test pits. The waste consisted of metallic debris such as rusted shell casings, at depths of 0 to 2 feet below the landfill surface. The cover material was thin to nonexistent. Two organics (possibly laboratory contaminants) and a low concentration of TPH were detected in the soil sample.

Groundwater samples were collected from the wells and elevated concentrations of metals were detected. VOCs were detected, although these compounds are consistent with contamination by common laboratory artifacts. For the surface water samples, several VOCs (low concentrations) typically associated with laboratory contaminants were detected. Metals concentrations were relatively low, and no PCB or pesticide compounds were detected. The sediment samples contained low concentrations of SVOCs and metals. It was considered likely that the SVOCs were associated with runoff from the adjacent railroad bed.

The RI investigation consisted of additional sampling and analysis of groundwater from the monitoring wells. Sampling for organics was not conducted during the RI. While organics, primarily acetone, were detected in several samples during the Phase II Site Investigation, acetone was also found in the equipment and trip blanks. Acetone was used in both the field and laboratory equipment decontamination processes. Because only metallic debris was found in the test pits (consistent with the reported use of the site), the organics found in Phase I were attributed to poor laboratory or field decontamination procedures.

Concentrations of most metals in Site 10 groundwater were within the range of background results; arsenic (4.7 ug/L in 10 GW 05), silver (1.5 ug/L in 10 GW 05), and thallium (3.7 ug/L in 10GW 04) were found in addition to the metals found in background samples. Iron was detected at an elevated concentration in 10 GW 04 (16,600 mg/L). In summary, results of investigations at Site 10 indicated that aluminum, iron, and manganese were found at concentrations above the corresponding NJDEP criteria. Figure 7-2 depicts sample locations with exceedences of applicable standards from the most recent sampling event. Table 7-1 summarizes the results of samples obtained from the groundwater monitoring wells compared to applicable standards.

Conclusions from previous investigations indicated that Site 10 surface water or sediment pathways were not contributing a significant human health risk to potential receptors. However, a surface or subsurface soil sample obtained in an area of exposed corroded shell casings would almost certainly show high metals concentrations. Groundwater scenarios were considered in the risk assessment for Site 10, and the HHRA concluded that the cancer risk associated with the future residential groundwater exposure scenario was approximately 7×10^{-5}, within the conservative USEPA guideline target acceptable risk range. The cancer risk associated with the future industrial groundwater exposure scenario was within the mid-range of the target acceptable risk range. The noncarcinogenic HIs associated with the future industrial and future residential groundwater exposure scenarios were below 1.0, the cutoff point below which adverse effects are not expected to occur. Lead groundwater concentrations at the site were below the USEPA action level for public water supplies and are not expected to be associated with significant increases in blood-lead levels based on the results of the IEUBK Lead Model (USEPA, 1994a).

The aquatic migration pathways and exposure routes were chosen in the ERA as the main concern for Site 10. Some elevated concentrations of metals were found in groundwater samples; however, most metals were within the range of background values. No organics were detected in the groundwater samples. No metals detected in groundwater were present at elevated concentrations in the sediments, suggesting the absence of groundwater discharge. In addition, the low concentrations of organics in drainage ditch sediments are more likely attributable to the railroad bed than the landfill. The ERA concluded that potential risks to ecological receptors at Site 10 and contaminant contributions to the Hockhockson Brook Watershed appear insignificant, and further study or remediation at the site based on ecological concerns was considered unwarranted. However, because cover material was heavily eroded, an additional landfill cover was recommended to prevent further erosion and runoff and to expedite ecological succession and increase vegetation cover on the landfill.

7.3 REMEDIAL ACTIONS

Based on the results of the RI/FS process, it was determined that a remedial action was necessary for Site 10. A ROD for Site 10 will be signed pending resolution of DoD/USEPA negotiations regarding land use controls. The following sections describe the process used to select and implement the appropriate remedial action for Site 10. A USEPA letter dated July 22, 2002 (see Appendix D) approved the Navy's proposed engineering remedy for landfill caps at Sites 3 and 10.

7.3.1 Remedy Selection

An FS for Site 10 (TtNUS, 1999) was completed in response to the recommendations of the RI (B&RE, 1996). The FS evaluated several remedial alternatives. In the case of former landfill sites like Site 10, USEPA has undertaken the presumptive remedies initiative to speed up selection of remedial actions. Based on the expectation that containment would generally be appropriate for landfill waste (such as that found at Site 10) and because the volume and heterogeneity of the waste generally make treatment impracticable, USEPA established containment as the presumptive remedy. Engineering technologies capable of eliminating the unacceptable risks associated with exposure to site-related soils, sediments, or groundwater were identified, and those alternatives determined to best meet RAOs after screening were evaluated in detail.

The PP and ROD concluded that capping of the landfill, institutional controls, and long-term groundwater monitoring should be the preferred remedial alternative. The Navy, with the support of USEPA and in consultation with NJDEP, selected this alternative, presented it in the PP in May 2001, and formally selected it in the ROD that will be signed pending resolution of DoD/USEPA negotiations regarding land use controls. This alternative is in compliance with the USEPA presumptive remedy and includes a CEA as required by the State groundwater quality protection criteria. The CEA (institutional controls) will cover

the area affected by the landfill. The cover/capping, grading, and vegetation will be placed over the former landfill to reduce infiltration, promote drainage, limit erosion, and preclude potential contact with the landfill contents. This alternative of containment, access restrictions, and institutional controls will limit exposures to site contaminants and is protective of human health and the environment. The institutional controls would reduce human health risks posed by contact with landfill contents and would provide assurance that untreated contaminated groundwater is not used as a potable water source in the future.

Based on ARARs and risk assessment results, the following RAO was selected for Site 10:

- Prevent potential human exposure to contaminated landfill materials.

The remedy selected for Site 10 will meet the RAO. The selected remedy is a containment option, as defined in the ROD, consisted of the following components:

- Institutional Controls - Institutional controls such as access restrictions will be attached to the Station Master Plan to limit future uses of the site to prevent disturbance of the landfill cap or direct contact with landfill materials. A cable-type fence with appropriate warning signs will be erected around the landfill to limit access to the site, to restrict human contact with contaminated landfill materials, and to protect the integrity of the soil cover. A CEA pursuant to N.J.A.C 7:9-6 will be established to ensure that use of groundwater in the affected area is suspended until long-term monitoring and periodic review can confirm protectiveness of the selected remedy. The institutional controls will prevent potential human and animal exposure to landfilled materials. The institutional controls will ensure maintenance of cap integrity, worker protection, and other considerations. Fencing and access restrictions will provide additional long-term protection by limiting access to the capped area and restricting future activities that could damage or intrude into the landfill cap. Restricted activities will include excavation and vehicular traffic (e.g., off-road vehicles and dirt bikes).

- Landfill Cap – An engineered cap consisting of the following components in ascending order: 12-inch gas management sand layer, low permeability geomembrane liner, 12-inch drainage sand layer, 12-ounce geotextile fabric layer, 12-inch cover soil layer and 6 inches of topsoil to support final seeding and vegetative cover. The engineered cap will prevent potential human and animal contact with landfill materials, promote drainage, limit erosion, and reduce infiltration of surface water. The graded vegetative cover system will be installed over the former landfill areas and will comply with federal and State municipal landfill closure and post-closure regulations. After construction, the cap will be maintained as needed.

- Groundwater Monitoring – Long-term, periodic groundwater monitoring will be conducted to assess contaminant status and potential threats to human health and the environment. Because wastes will be left in place, site conditions and risks will be reviewed every 5 years.

The HHRA concluded that site groundwater does not pose carcinogenic or non-carcinogenic risks exceeding USEPA's target risk range, but regulators want to prohibit the use of untreated groundwater as drinking water in the landfill area. The long-term, periodic monitoring program will allow the responsible agency to monitor the quality of groundwater leaving the site, assess potential impacts to downgradient receptors, and determine whether additional remedial actions are necessary. Capping the landfill with a low-permeability cover system will reduce infiltration of precipitation into the landfill thereby adding an additional measure of protection against leaching of landfill contents into groundwater.

By regrading the landfill surface to preclude erosion, placing a cap over the landfill to avoid potential direct contact with landfill contents and to reduce infiltration of precipitation into the landfill, and establishing a formal CEA to bar the use of site groundwater during the remediation period, the Navy will reduce the unacceptable risks associated with Site 10. This alternative is believed to provide the best balance of protection among the alternatives with respect to response criteria. The RAO for protection of human health and the environment will be achieved upon construction of the remedy selected for Site 10.

The remedy selected for Site 10 satisfies the remedy selection requirements of CERCLA and the NCP. Based on available information, the Navy, USEPA, and NJDEP believe the remedy will be protective of human health and the environment, complies with ARARs (statutory requirements of USEPA, the state, and the local community), and is cost-effective.

7.3.2 Remedy Implementation

The RD for Site 3 was completed for the Navy by a contractor in September 2001 (FWNC, 2001). Additional field work (e.g., field survey, geotechnical field investigation, and geotechnical laboratory testing program) was conducted to collect the data necessary to complete the design.

The cover system is similar to a landfill cap installed at IRP Site 4 that contained domestic and industrial wastes (predominantly metals and other inert materials). Minor modifications were made to the final cover system design as a result of normal refinement of details during the implementation. The components from top to bottom are as follows:

- Top Layer - protects the cover from erosion by rain or wind and from burrowing animals and is vegetated with permanent plant species such as grasses and legumes.

- Drainage Layer - prevents accumulation of water above the infiltration barrier layer that could damage the geomembrane liner or cause erosion of the top layer.

- Barrier Layer - minimizes precipitation infiltration into the landfill materials and, in accordance with applicable regulations and guidance, the barrier has a maximum permeability of 1 x 10^{-7} cm/s, and consists of a geomembrane.

- Gas Management Layer – prevents the accumulation of gas below the barrier layer that could damage the geomembrane.

- Subgrade - provides a well-compacted and smooth surface to provide a stabilized layer for the rest of the cover system. The subbase layer is the former subgrade soil and/or borrow material.

The details of the cover system presented in the FS and PP (asphalt or soil cap) vary slightly from the cover system in the RD (low-permeability cover). However, the overall protection of human health and the environment remains equivalent. The Navy chose to implement a more protective low-permeability cover at Site 10 because of the close proximity to extensive wetlands and a stream. The low permeability cover can be installed without impact to the wetlands or stream or encroachment onto the rail line versus an asphalt or soil cap that would need to extend further beyond the filled area to be effective and would have some impact on the wetland, stream, and/or rail line. The military nature of the landfilled materials at the site warrants a higher level of protection. Although evidence suggests that only inert demilitarized items were placed in this landfill, a more conservative remedy is justified. The incremental cost difference for the low-permeability cover versus an asphalt or soil cap at a site this small and is considered relatively minor for the increased level of protection achieved.

The final surface slope of the cover system in the landfill area will be sloped gently to a series of perimeter stormwater drains. Stormwater from the cap area will discharge to the adjacent drainage ways. The capped area will encompass all landfill materials.

The Navy's RAC mobilized to the site to begin preliminary construction activities in September 24, 2002, and the remedial action is currently ongoing. The expected completion data of the remedial action is June 2003. Details regarding the remedial action will be summarized in the final report for the remedial action or a close-out report.

To ensure the quality of the remedial action, quality control testing and inspection were completed during the remedial action in accordance with the CQC) Plan and the MQA /CQA Plan.

The capital cost for implementation of the preferred remedial alternative were estimated in the ROD at $1,072,000 for site 10 and $878,000 for site 3, for a total of $1,950,000 (both sites). This estimate included costs associated with site preparation, site grading, soil cover placement, and security fencing. The actual cost for the implementation of the RD has not yet been tabulated because the remedial actions are ongoing. The actual award was $2,446,500 for both sites.

To meet the institutional control requirements in the ROD, the Navy will place land use restrictions into the Base Master Plan for IR Site 10 at NWS Earle. The land use restrictions define access limitations precluding actions that could result in ground surface disturbance of soils or any subsurface disturbance that could result in damage to the landfill cover. Implementation of the CEA under NJDEP guidelines will ensure that untreated groundwater beneath the site will not be used for a drinking water source.

Other components of the remedial action, including long-term groundwater monitoring and O&M, are discussed below in Section 7.3.3.

7.3.3 System Operations/Operations and Maintenance

The Navy will implement a monitoring program at Site 10 after the remedial action is completed. The results of the program will be used to assess the effectiveness of the remedial action. Sampling will be completed at the site on an annual basis in accordance with an O$M manual that will be developed. Monitoring reports will be prepared to document the results of the monitoring program and will be submitted to the USEPA and NJDEP for review and comment. The annual reports will include an evaluation of the data collected under the program and provide a brief screening-level assessment of the data.

The average annual O&M costs (includes long-term monitoring, mowing, cover and fence repairs, etc.) are estimated at $20,000 per year for 30 years, and five-year reviews costs are estimated at $15,500 per event in the ROD. The actual costs for the implementation of maintenance and periodic monitoring have not yet been tabulated because remediation construction is not complete.

7.4 FIVE-YEAR REVIEW FINDINGS

7.4.1 Site Inspection

A site inspection was conducted at Site 10 in January 2003. The focus of the inspection at Site 10 was the status of landfill cap system installation. Weather conditions during the inspection were favorable, with mild temperatures and no precipitation. A representative from TtNUS performed the inspection.

Photographs taken of the site during the site inspection are provided in Appendix A. A site inspection checklist was completed during the inspection. The completed checklist is provided in Appendix B.

The site inspection included visual observations of the current construction of the landfill cap at Site 10. During the site inspection, the inspector found that the land use for the site has remained unchanged since the ROD was completed and that landfill cap installation was substantially complete. Warning signs and fencing were not yet in place at the site. Implementation of land use controls, including enacting the CEA and placing limits on land use in the NWS Earle Base Master Plan, were not yet completed.

7.4.2 Document and Analytical Data Review

The documents reviewed for the five-year review are listed below, and key information obtained from the documents is summarized in the following paragraphs.

- RI Report
- FS for Sites 3 and 10 (OU 6)
- ROD, OU 6, Sites 3 and 10
- Proposed Plan for OU 6
- Remedial Action Work Plan (Remedial Design Report) for Site 10

A review of the RI, FS, and ROD for Site 10 provided the background for the site, RAO, ARARs, and a description of the selected remedy for the site. The review also provided the cost estimate for the remedial alternative.

A review of the Remedial Design Report for Site 10 provided the details of the design of the engineered landfill cap system. The design included the final landfill cap components.

The Operations and Maintenance Manual for the Site 10 (when it is prepared) will provide the monitoring well network to be used for the long-term groundwater monitoring program. The plan will also detail the analytical program, monitoring criteria, and data evaluation approach.

7.4.3 ARAR and Site-Specific Action Level Changes

The remedial action implemented at Site 10 includes an engineered landfill cap, institutional controls, long-term monitoring, and O&M. ARARs and TBCs were reviewed to determine whether there have been changes since the ROD was prepared. The chemical-specific, location-specific, and action-specific ARARs, advisories, and guidance values (TBCs) that have changed are provided in the table below. No changes associated with monitoring are applicable because the long-term monitoring plan has yet to be prepared.

The ERA concluded that potential risks to ecological receptors at Site 10 and contaminant contributions to the Hockhockson Brook Watershed appear insignificant. Further study or remediation at the site based on ecological concerns was considered unwarranted. The site is currently in the process of being capped which will further eliminate potential exposure pathways. Therefore, changes in the screening values since the completion of the ERA should not impact the effectiveness of the remedial action.

Contaminant	ARAR/Site-Specific Level		Source
GROUNDWATER			
Arsenic	Previous	50 µg/L	Primary Drinking Water Standard
	Previous	8 µg/L	NJDEP Groundwater Quality Standard
	New	10 µg/L	Primary Drinking Water Standard

7.5 ASSESSMENT

The following conclusions support the determination that the remedy for Site 10 is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

- ***HASP/Contingency Plan:*** An O&M program will be implemented at Site 10 upon completion of the construction of the cap system. The results of the program will be used to evaluate the cap's performance regarding minimizing contaminant migration. Should groundwater data indicate a need to evaluate additional remedial actions at some point in the future, the Navy will perform the evaluation at that time.

- ***Implementation of Institutional Controls and Other Measures:*** Institutional controls associated with Site 10 are being implemented in accordance with the ROD. Upon completion of the construction of the cap system, fencing will be placed around the site and signs will be posted at the site entrances warning that access is only for authorized users, that a cap is in place, and that no digging is allowed. These controls meet the intent of the institutional controls RAO discussed in Section 7.3.

- ***Remedial Action Performance:*** A cap system is being installed at Site 10 that will be effective in limiting direct exposure to contaminated soil and minimizing contaminant migration from the site. A long-term monitoring program will be implemented to evaluate the cap's performance regarding minimizing contaminant migration. Proper O&M will be necessary to maintain proper long-term performance of the cap system.

- ***System Operations/O&M:*** Installation of the cap system will be completed in June 2003. At that time, the system will be functioning as intended. An O&M plan will be developed and implemented.

- ***Cost of Operations/O&M:*** No actual costs for the groundwater monitoring program are available at this time. No actual O&M costs for the cap system are available at this time.

- ***Opportunities for Optimization:*** No opportunities for optimization are available at this time because O&M have not been implemented. After completion of the landfill cap system and initiation of the groundwater monitoring program, the frequency of sampling for the long-term monitoring program should be reviewed and optimized as needed. The analytical parameter list for the groundwater monitoring program should be reviewed and optimized as needed. Changes to the long-term monitoring program may be implemented as early as after the first year of monitoring.

- ***Early Indicators of Potential Remedy Failure:*** There were no deficiencies noted at this time.

Question 2. Are the assumptions used at the time of the remedy selection still valid?

- ***Changes in Standards and TBCs***: ARARs and TBCs considered during preparation of the ROD were reviewed to determine changes since the ROD was prepared. As presented in Section 7.4.3, there have been minor changes to currently relevant ARARs. The changes in the Primary Drinking Water Standards and the NJDEP Cleanup Standards for Contaminated Sites do not impact the protectiveness of the remedy.

- ***Changes in Toxicity and Other Contaminant Characteristics:*** There have been no changes in the human health toxicity criteria that will impact the primary or secondary monitoring criterion. A change has occurred in the toxicity factor for manganese (RfD increase). However, toxicity factors for several other COPC metals have not changed, and most of the other COPCs were eliminated based on the risk assessment. Although long-term monitoring has not yet begun at the site, the change in the manganese RfD could significantly change the HI sum compared to the HI reported in the RI. Manganese would still be selected as a COPC, but the HI would now be less than 1. However, the NJDEP regulatory criteria for manganese would still be exceeded using the maximum concentration reported in the RI.

- ***Changes in Risk Assessment Methodologies:*** As discussed in Section 1.4, there have been no major changes in HHRA or ERA methodology since preparation of the ROD.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

7.6 DEFICIENCIES

No major deficiencies were identified during the five-year review of the site.

7.7 RECOMMENDATIONS AND REQUIRED ACTIONS

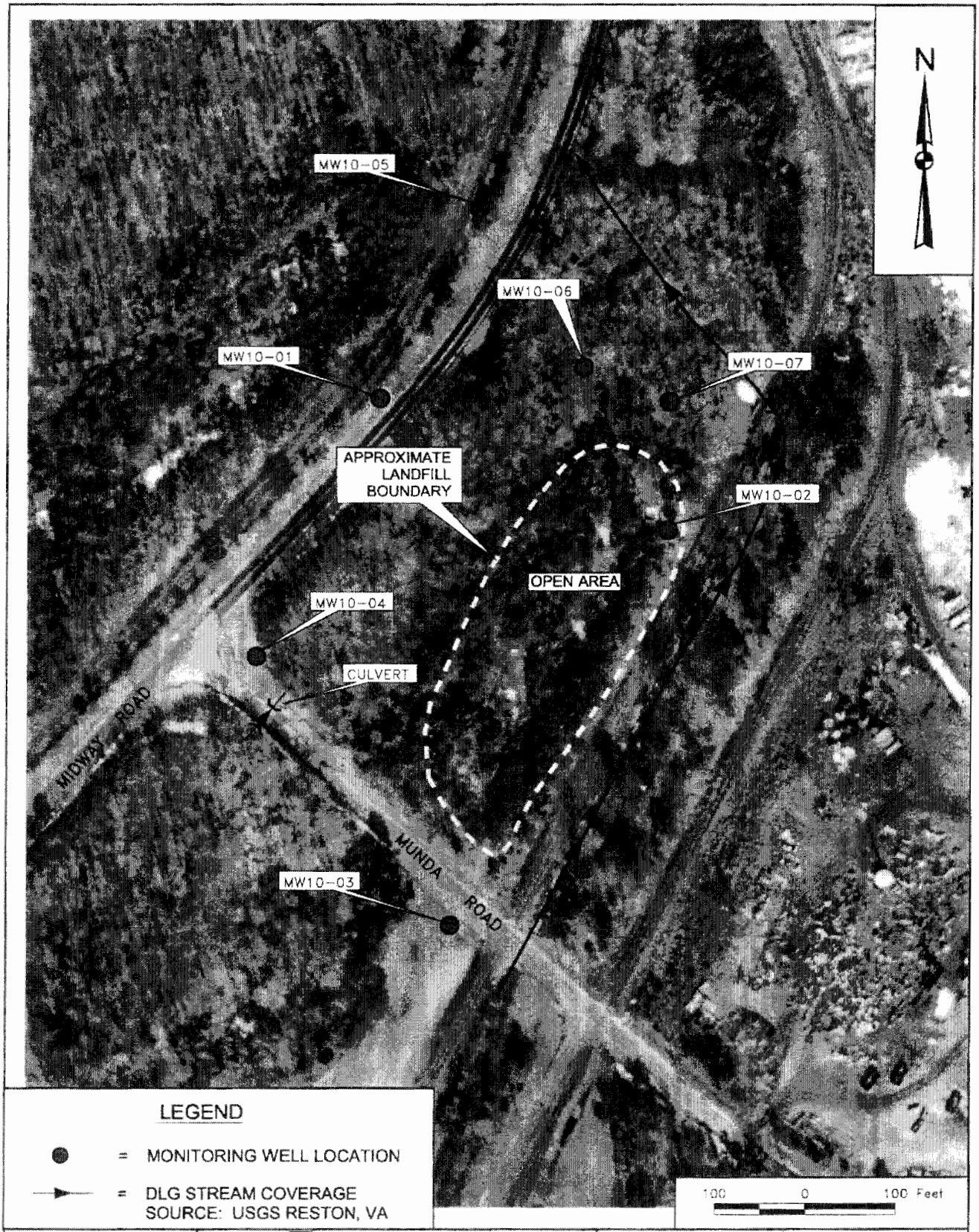
Based on the results of the site inspection and review, the following recommendations and actions are required for Site 10.

- Complete the installation of the engineered landfill cap system as designed
- Prepare an O&M Manual
- Begin the long-term monitoring in accordance with the O&M Manual.
- Consider optimizing the sampling frequency and analytical parameter list after the long-term monitoring program has been implemented.
- Restrict access to the site.

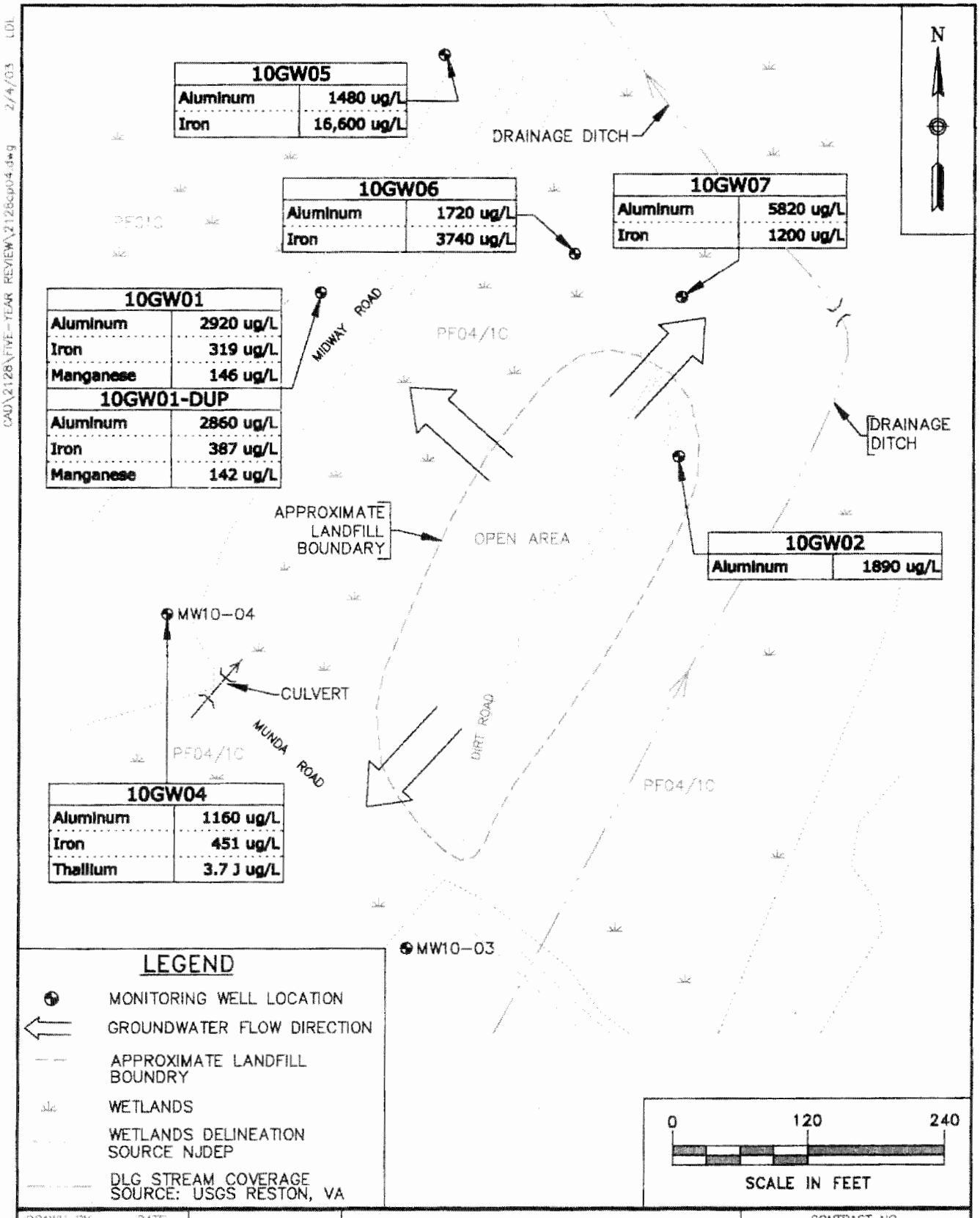
7.8 PROTECTIVENESS STATEMENT

The remedy at Site 10 is expected to be protective of human health and the environment upon completion. The source of contamination is contained and in the interim, the exposure pathways that could result in unacceptable risks are being controlled. The cover system will minimize infiltration and subsequent contaminant migration and prevent direct contact with soil and contaminated landfill materials. The long-term monitoring program will be implemented to verify that the cap is performing as designed. Proper implementation of the institutional controls and O&M will maintain the effectiveness of the remedy into the future. The institutional controls, through the CEA, will place restrictions on use of site groundwater.

The Navy, USEPA, and NJDEP have determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at Site 10. Based on the completed activities and the activities that are underway or planned, the intent and goals of the ROD for Site 10 have or will be met.



DRAWN BY: LDL	DATE: 1/17/03	Tetra Tech NUS, Inc.	CONTRACT NUMBER: 2128 / OWNER No: FIVE-YEAR REVIEW
CHECKED BY: RFD	DATE: 2/6/03	SITE PLAN OPERABLE UNIT 6, SITE 10 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	PROJECT FILE: NWS-Earle-1-PHL.apr LAYOUT: FIVE-YEAR REVIEW-SITE 10
COST/SCHEDULE-AREA			APPROVED BY: RET / DATE: 2/26/03
SCALE: AS NOTED			DRAWING No: FIGURE 7-1 / REV



DRAWN BY LDL DATE 2/4/03	Tetra Tech NUS, Inc.	GROUNDWATER CONCENTRATIONS ABOVE REGULATORY CRITERIA OPERABLE UNIT 6, SITE 10 NAVAL WEAPONS STATION EARLE COLTS NECK, NEW JERSEY	CONTRACT NO. 7695
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TABLE 7-1

MAXIMUM CONCENTRATIONS OF CHEMICALS OF POTENTIAL CONCERN
OPERABLE UNIT 6, SITE 10
NWS EARLE, COLTS NECK, NEW JERSEY

RI Chemicals of Potential Concern	Remedial Investigation		Last Long-Term Monitoring Event	Background		Regulatory Criteria[2]
	Frequency of Detection[1]	Maximum Concentration	Maximum Concentration	Frequency of Detection	Maximum Concentration	USEPA/NJDEP
INORGANICS (µg/L)						
Aluminum	7/7	5820	NA[3]	11/11	7870	NS/200
Arsenic	1/7	4.7	NA	1/11	5.8	10/8
Beryllium	6/7	1.8	NA	4/11	1.6	4/20
Cadmium	3/7	0.85	NA	5/11	1.9	5/4
Copper	1/7	6.7	NA	9/11	13.5	1300/1000
Iron	7/7	16600	NA	11/11	7690	NS/300
Lead	2/7	2.55	NA	3/11	3	15/10
Manganese	7/7	144	NA	11/11	65	NS/50
Mercury	7/7	0.11	NA	11/11	0.12	2/2
Silver	1/7	1.5	NA	0/11	Not Detected	-NS/NS
Thallium	1/7	3.7	NA	10/11	5.1	2/10

[1] Frequency of detection is the number of samples in which the analyte was detected over the total number of samples analyzed.

[2] USEPA Maximum Contaminant Level/NJDEP Ground Water Quality Standards N.J.A.C. 7:9-6.

[3] Not Analyzed. Long-term monitoring has not begun at the site.

Shading indicates that the value is greater than regulatory criteria.

NS = No standard.

8.0 BASEWIDE CONCLUSIONS AND RECOMMENDATIONS

The basewide conclusions and recommendations are presented below. These conclusions and recommendations are provided in the form of a basewide protectiveness statement and summary of the requirements of the next five-year review.

8.1 PROTECTIVENESS STATEMENT

The remedial actions that have been completed for the sites at NWS Earle are protective of human health and the environment. Remedial actions to address immediate or potential threats from exposure to site-related media have been implemented (Sites 4, 5, 19, and 26) or are being implemented at the time of this review (Sites 3 and 10). The Navy is continuing the CERCLA investigation/decision process for the remaining IR sites that have not already received NFA agreements.

This five-year review shows that the Navy in conjunction with USEPA and in concurrence with NJDEP is meeting the requirements of the RODs for the six subject IR sites at NWS Earle. No significant deficiencies have been noted in the program as of this review.

8.2 NEXT REVIEW

Five-year reviews are required by statute or as a matter of policy, depending on the RAOs defined in the ROD and the remedial actions that were completed at the sites. NWS Earle has sites requiring statutory and policy five-year reviews. This report represents the First Five-Year Review conducted at NWS Earle. The next five-year review will be required in February 2008 (i.e., within 5 years of the signature date of this review). A summary of the anticipated requirements for the next five-year review is provided below.

The next five-year review should include a detailed review of the costs for implementing the remedial action at the sites in this review, specifically the long-term monitoring programs to confirm that the remedies are proceeding as planned. The review should also include a detailed evaluation of the monitoring activities at Sites 3, 10, and 26 because, at the time of this review, these activities had only occurred for approximately 1 to 2 years. The O&M plan for Sites 26, 3, and 10 were not complete at the time of this review; therefore, these plans should be implemented and a review of the O&M costs should be completed during the next five-year review period. The review should also verify that the NWS Earle Master Plan for Sites 26, 3 and 10, implementing institutional controls, has been properly revised.

8.2.1 Statutory Review

Sites 3, 4, 5, and 10 will require a statutory review during the next five-year review for NWS Earle. The next review of these will require an evaluation of the long-term monitoring reports. The next review of Sites 3 and 10 will also require the site close-out report that details the construction of the cover/cap systems that were being constructed at the time of this review. Five-year reviews will continue at Sites 3, 4, 5, and 10 because potential site-related risks remain at the sites that will not allow for unlimited use or unrestricted exposure.

8.2.2 Policy Review

Sites 19 and 26 will require policy five-year reviews until the remedial actions are completed and the clean-up levels are achieved allowing unlimited use and unrestricted exposure. The next review of Sites 19 and 26 will require an evaluation of the long-term monitoring reports.

At Site 19, the removal action has been completed for the soil and no hazardous substances remain on site that would limit use or restrict exposure. The groundwater OU for this site is being addressed by the long-term monitoring, and the groundwater may still contain contamination that would not allow for unlimited or unrestricted use. If the groundwater contamination has decreased and meets the NJDEP cleanup criteria before the next five-year review, an NFA memorandum should be prepared.

8.2.3 Reviews for Sites with RODs Published Since This Five-Year Review

Several other sites at NWS Earle that were investigated in the RI were not included in this five-year review because no ROD has been prepared that identifies the selected remedial action, and no remedial actions have been conducted at these site. It is anticipated that the RODs for some of these sites will be completed and the remedial actions will be in progress at the time of the next review. The next review will include these sites.

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REFERENCES

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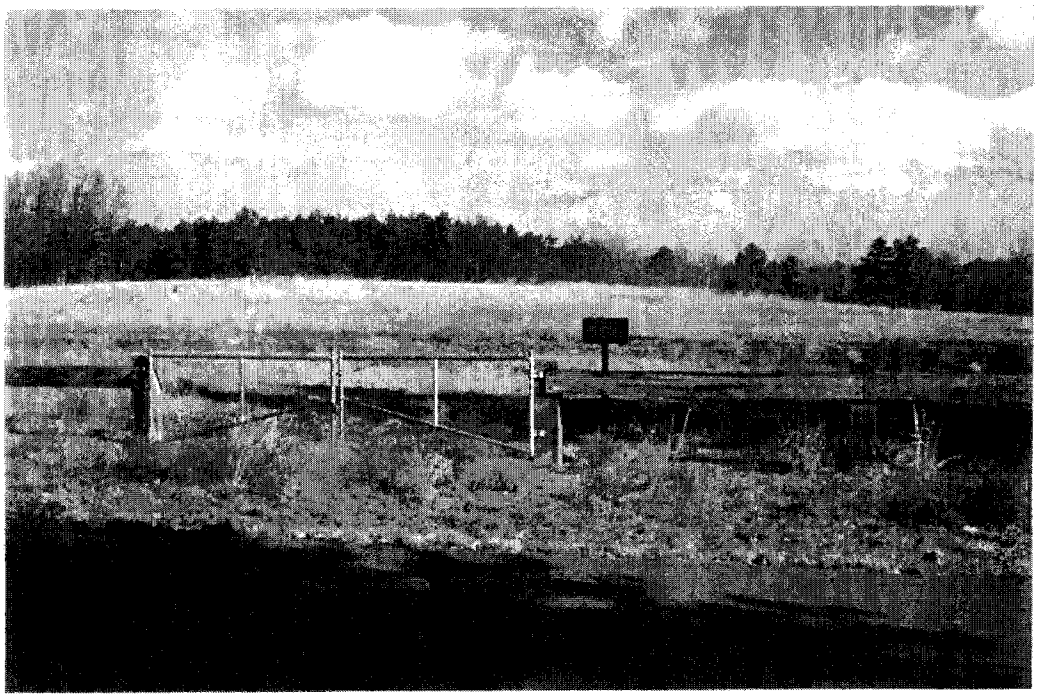
APPENDICES

APPENDIX A

SITE PHOTOGRAPHS



Site 4 – Landfill West of "D" Group
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 4 – Landfill West of "D" Group
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

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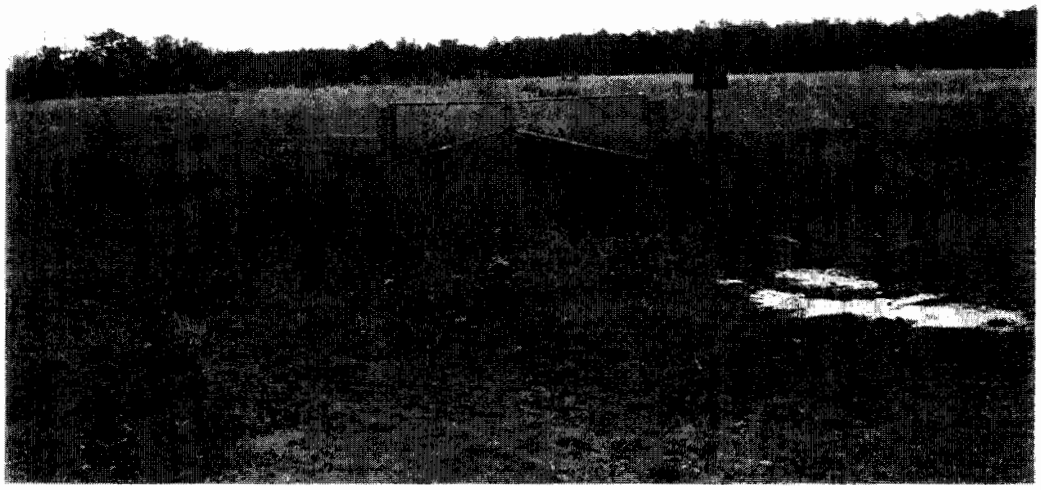
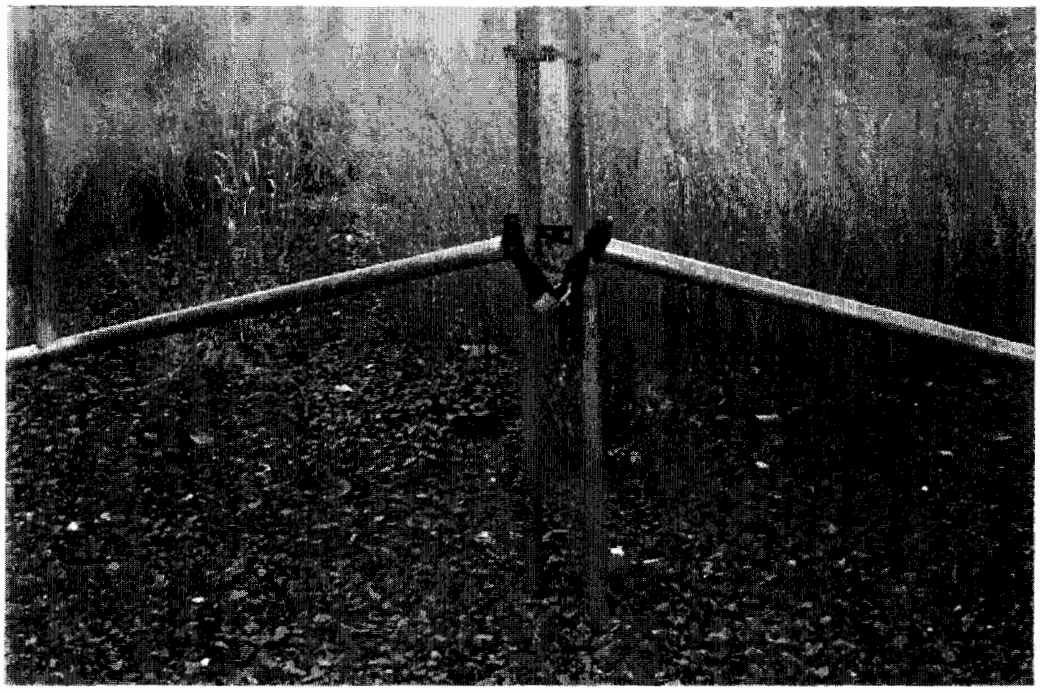
Site 4 – Landfill West of "D" Group
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843



Site 5 – Landfill West the Army Barricades
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

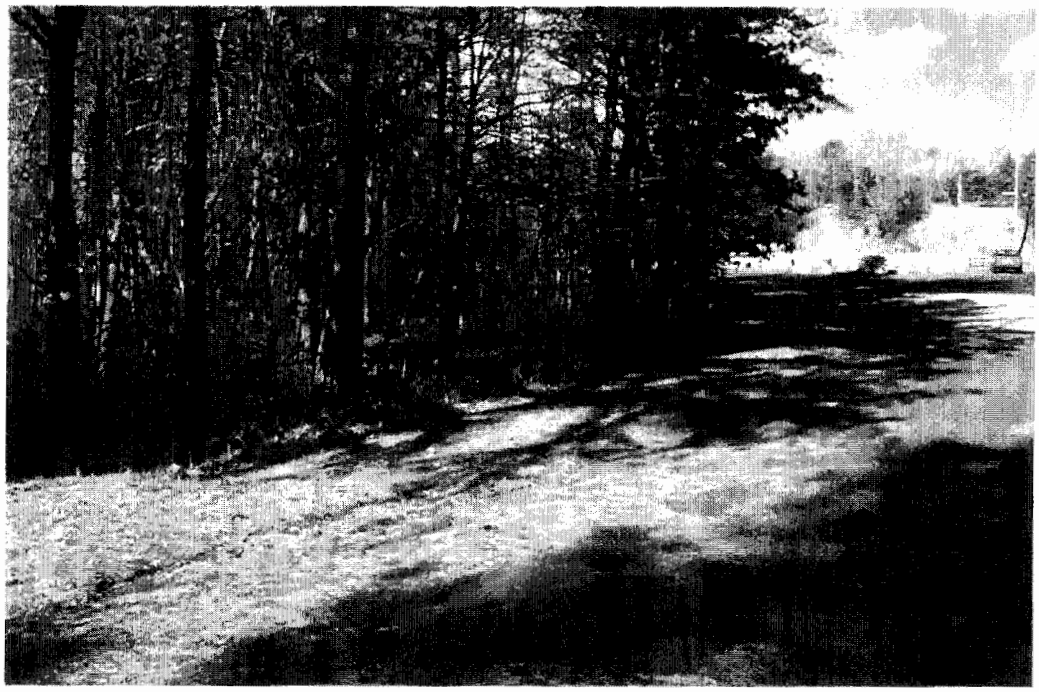


Site 5 – Landfill West the Army Barricades
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 5 – Landfill West the Army Barricades
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 5 – Landfill West the Army Barricades
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 19 – Former Paint Chip and Sludge Disposal Area
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843



Site 19 – Former Paint Chip and Sludge Disposal Area
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

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January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

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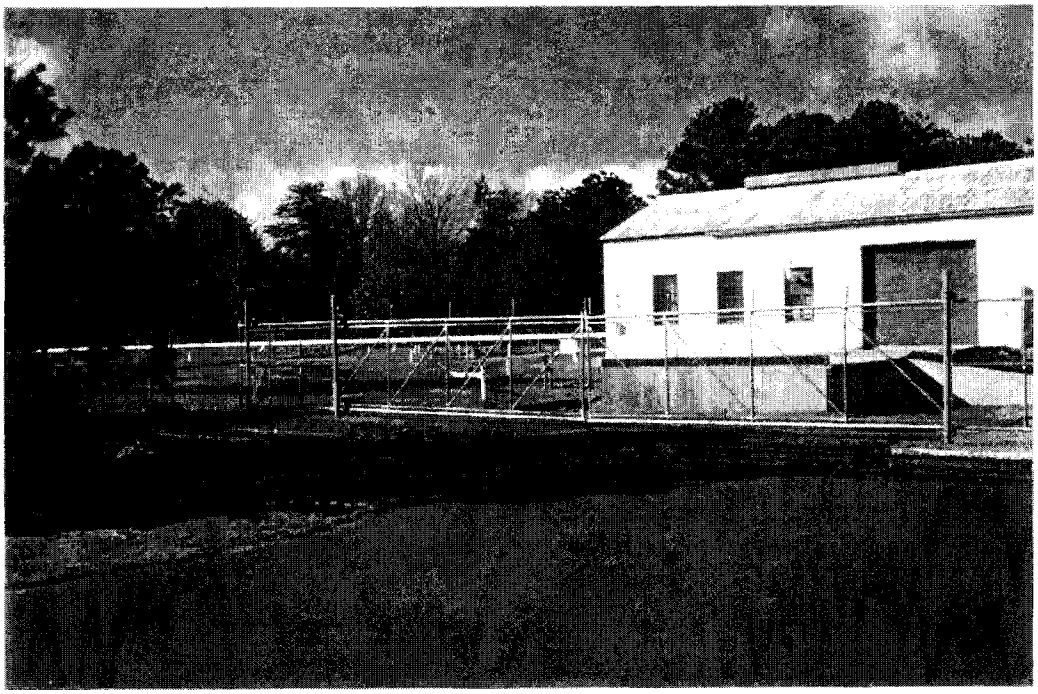
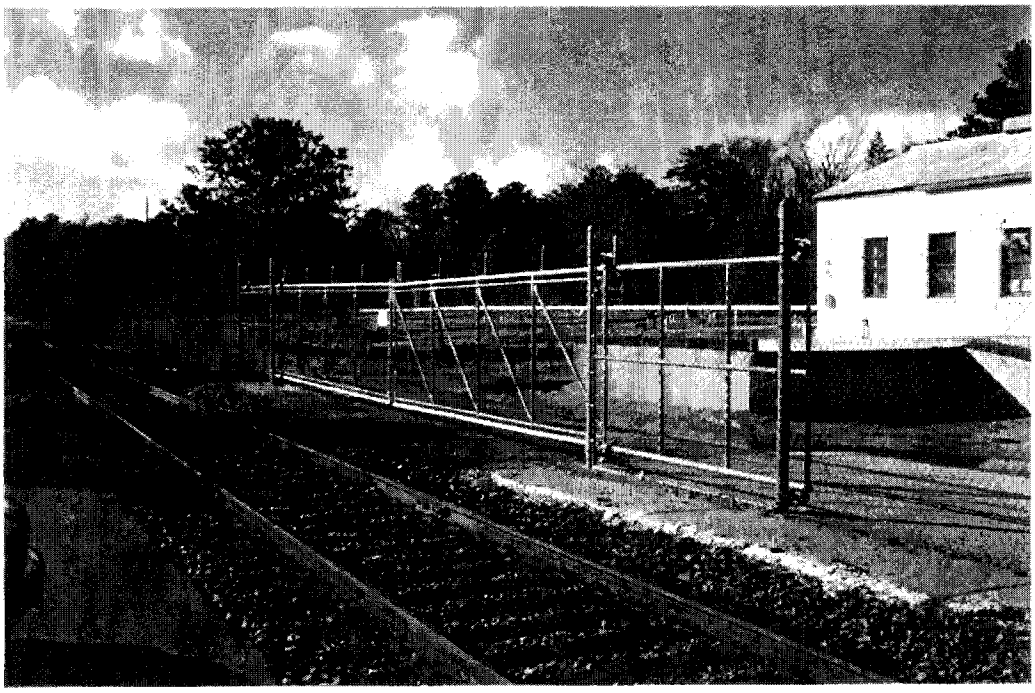
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843



Site 26 – Explosive "D" Washout Area
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

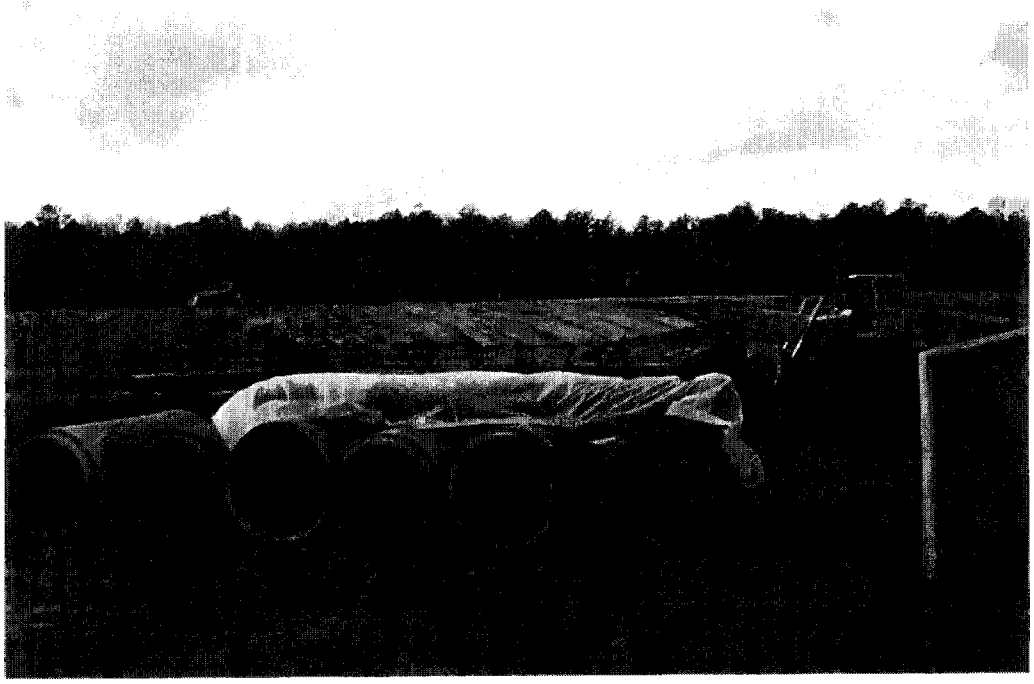


Site 26 – Explosive "D" Washout Area
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

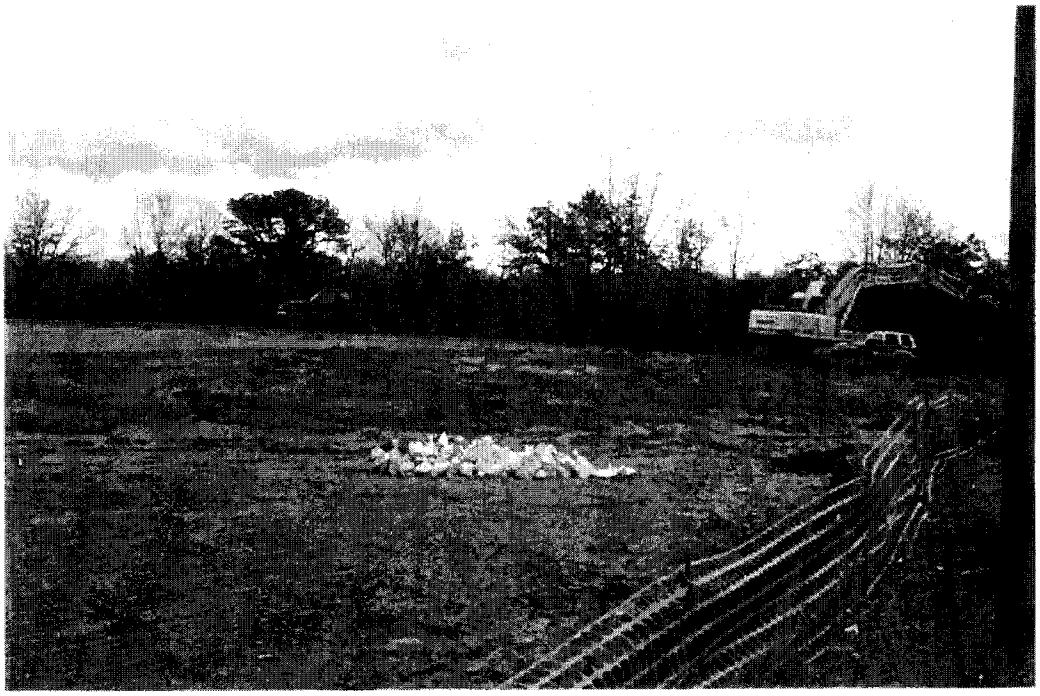
Site 26 – Explosive "D" Washout Area
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 3 – Landfill Southwest of "F" Group
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 3 – Landfill Southwest of "F" Group
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843



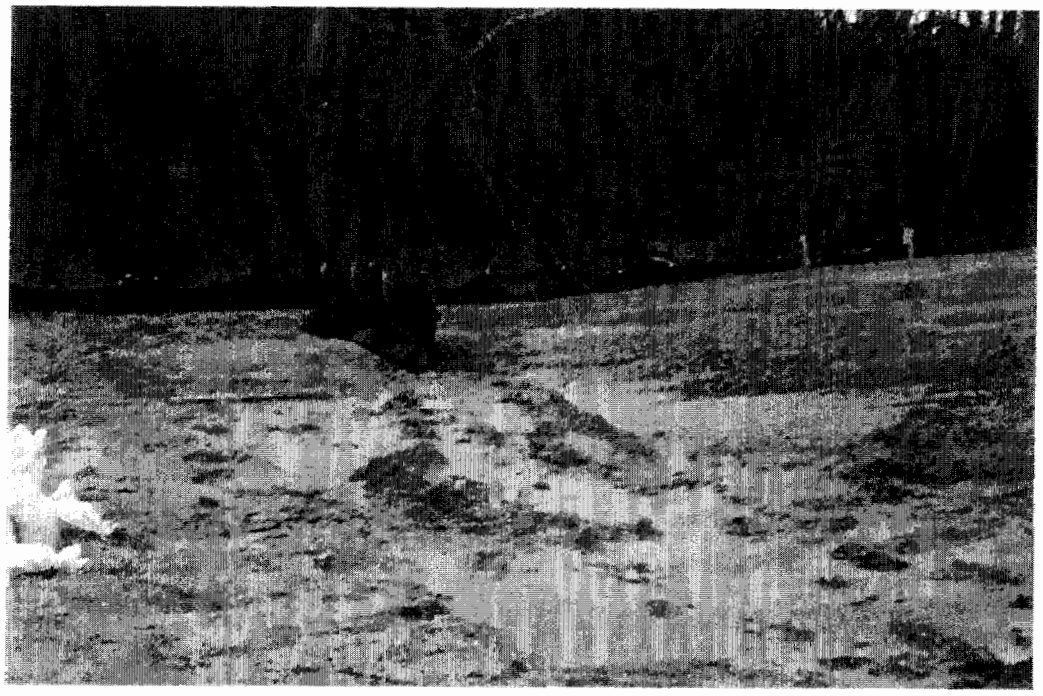
Site 3 – Landfill Southwest of "F" Group
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843



Site 10 – Scrap Metal Landfill
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 10 – Scrap Metal Landfill
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

Site 10 – Scrap Metal Landfill
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843



Site 10 – Scrap Metal Landfill
January 2003
NWS Earle, Colts Neck, New Jersey. CTO 0843

APPENDIX B

FIVE-YEAR REVIEW INSPECTION CHECK LISTS

(2)

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 4	**Date of inspection:** Jan. 10, 2003
Location and Region: NWS Earle EPA Region II Ordnance	**EPA ID:** NJ0170022172
Agency, office, or company leading the five-year review: TetraTech NUS / NAVY	**Weather/temperature:** Sunny / 45°F

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- ✓ Other Long-term Monitoring - groundwater
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached ✓ET Site map attached See Report Section

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. ✓ **O&M Documents**

✓ O&M manual	Readily available	Up to date	N/A
As-built drawings	Readily available	Up to date	N/A
Maintenance logs	Readily available	Up to date	N/A

Remarks O+M Manual for the Site 4+5 Landfills

2. **Site-Specific Health and Safety Plan** Readily available Up to date N/A
   Contingency plan/emergency response plan Readily available Up to date N/A
   Remarks

3. **O&M and OSHA Training Records** Readily available Up to date N/A
   Remarks

4. **Permits and Service Agreements**

Air discharge permit	Readily available	Up to date	N/A
Effluent discharge	Readily available	Up to date	N/A
Waste disposal, POTW	Readily available	Up to date	N/A
Other permits	Readily available	Up to date	N/A

Remarks

5. **Gas Generation Records** Readily available Up to date N/A
   Remarks

6. ✓ **Settlement Monument Records** Readily available Up to date N/A
   Remarks INCLUDED IN 2001 ANNUAL GROUNDWATER SAMPLING OF MONITORING WELLS (FOSTER WHEELER, 2002)

7. ✓ **Groundwater Monitoring Records** Readily available Up to date N/A
   Remarks INCLUDED IN 2001 ANNUAL GROUNDWATER SAMPLING OF MONITORING WELLS (FOSTER WHEELER, 2002)

8. **Leachate Extraction Records** Readily available Up to date N/A
   Remarks

9. **Discharge Compliance Records**

Air	Readily available	Up to date	N/A
Water (effluent)	Readily available	Up to date	N/A

Remarks

10. ✓ **Daily Access/Security Logs** Readily available Up to date N/A
    Remarks The site is Located within a secure area within a secure Naval Facility. Two I.D. Checks are required For Access.

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility ✓
Other_____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate_____ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS

(Applicable) N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured ✓ N/A
Remarks Fence & Gates in Excellent condition - Gates are Secured & Locked

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
Remarks Numerous Signs in Good repair - easily Read

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes (No) N/A
Site conditions imply ICs not being fully enforced — Yes (No) N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Double Security ID checks
Frequency Continuous
Responsible party/agency USAAMV
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — (Yes) No N/A
Reports are verified by the lead agency — Yes No N/A

Specific requirements in deed or decision documents have been met — Yes No N/A
Violations have been reported — Yes No N/A
Other problems or suggestions: Report attached

NWS GARLIC MASTER PLAN

2. **Adequacy** ICs are adequate Yes ICs are inadequate N/A
Remarks More than Adequate

D. General

1. **Vandalism/trespassing** Location shown on site map ✓ No vandalism evident
Remarks

2. **Land use changes on site** N/A
Remarks NONE

3. **Land use changes off site** N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** ✓ Location shown on site map Roads adequate ✓ N/A
Remarks Asphalt Roads in Good Condition

B. Other Site Conditions

Remarks Signage & Fencing in Excellent Condition

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map ✓ Settlement not evident
   Areal extent_____ Depth_____
   Remarks No Settlement Evident

2. **Cracks** Location shown on site map ✓ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks No Cracks

3. **Erosion** Location shown on site map ✓ Erosion not evident
   Areal extent_____ Depth_____
   Remarks No Erosion - Drainageways in Excelent Condition.

4. **Holes** Location shown on site map ✓ Holes not evident
   Areal extent_____ Depth_____
   Remarks No Holes

5. **Vegetative Cover** ✓ Grass ✓ Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks No Trees or Shrubs

6. **Alternative Cover (armored rock, concrete, etc.)** Yes N/A
   Remarks Rock in Drainage in Good Condition

7. **Bulges** Location shown on site map ✓ Bulges not evident
   Areal extent_____ Height_____
   Remarks No Bulges

8. **Wet Areas/Water Damage** ✓Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks No Wetares or Damage evident

9. **Slope Instability** Slides — Location shown on site map — ✓No evidence of slope instability
   Areal extent_____
   Remarks No Slides

B. Benches Applicable (N/A)
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** — Location shown on site map — N/A or okay
   Remarks

2. **Bench Breached** — Location shown on site map — N/A or okay
   Remarks

3. **Bench Overtopped** — Location shown on site map — N/A or okay
   Remarks

C. Letdown Channels Applicable N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** — Location shown on site map — No evidence of settlement
   Areal extent_____ Depth_____
   Remarks

2. **Material Degradation** — Location shown on site map — No evidence of degradation
   Material type_____ Areal extent_____
   Remarks

3. **Erosion** — Location shown on site map — No evidence of erosion
   Areal extent_____ Depth_____
   Remarks

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active (Passive)
Properly secured/locked Functioning Routinely sampled (Good condition)
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks Vents in Excellent Condition.

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
✓ Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks No problems Evident

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance (N/A)
Remarks_____

5. **Settlement Monuments** Located (Routinely surveyed) (N/A)
Remarks_____

E. Gas Collection and Treatment Applicable ~~N/A~~

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks None Seen

2. **Outlet Rock Inspected** Functioning N/A
   Remarks Excellent Condition

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks No Sedimentation Observed

2. **Erosion** Areal extent_____ Depth_____
   ~~Erosion~~ not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks Good Condition

4. **Dam** Functioning ~~N/A~~
   Remarks_____

H. Retaining Walls Applicable (N/A)

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks No Siltation

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks Minor Vegation Limited Spots

3. **Erosion** Location shown on site map ~~Erosion~~ not evident
   Areal extent_____ Depth_____
   Remarks No Erosion

4. **Discharge Structure** Functioning N/A
   Remarks Good Condition

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal — Oil/water separation — Bioremediation
   - Air stripping — Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition — Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A — Good condition — Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A — Good condition — Proper secondary containment — Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A — Good condition — Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   N/A — Good condition (esp. roof and doorways) — Needs repair
   Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked — Functioning — Routinely sampled — Good condition
   All required wells located — Needs Maintenance — N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained — Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

SAMPLE EVERY 2 YEARS

ANALYSIS FOR COPCs ONLY

(6)

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Sites Landfill	**Date of inspection:** Jan. 10, 2003
Location and Region: NWS EARLE - EPA REGION 2	**EPA ID:** NJ0170022172
Agency, office, or company leading the five-year review: NAVY	**Weather/temperature:** Partly Sunny / 42°F

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- ✓ Other LONG TERM MONITORING - GROUNDWATER
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached ILT Site map attached See Report Section

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

✓ O&M manual	Readily available	Up to date	N/A
As-built drawings	Readily available	Up to date	N/A
Maintenance logs	Readily available	Up to date	N/A

Remarks O+M MANUAL FOR SITE 4+5 LANDFILLS

2. **Site-Specific Health and Safety Plan** Readily available Up to date N/A
   Contingency plan/emergency response plan Readily available Up to date N/A

Remarks

3. **O&M and OSHA Training Records** Readily available Up to date N/A

Remarks

4. **Permits and Service Agreements**

Air discharge permit	Readily available	Up to date	N/A
Effluent discharge	Readily available	Up to date	N/A
Waste disposal, POTW	Readily available	Up to date	N/A
Other permits	Readily available	Up to date	N/A

Remarks

5. **Gas Generation Records** Readily available Up to date N/A

Remarks

6. ✓ **Settlement Monument Records** Readily available Up to date N/A

Remarks INCLUDED IN 2001 ANNUAL GROUNDWATER SAMPLING OF MONITORING WELLS (FOSTER WHEELER, 2001)

7. ✓ **Groundwater Monitoring Records** Readily available Up to date N/A

Remarks INCLUDED IN 2001 ANNUAL GROUNDWATER SAMPLING OF MONITORING WELLS (FOSTER WHEELER, 2001)

8. **Leachate Extraction Records** Readily available Up to date N/A

Remarks

9. **Discharge Compliance Records**

Air	Readily available	Up to date	N/A
Water (effluent)	Readily available	Up to date	N/A

Remarks

10. ✓ **Daily Access/Security Logs** Readily available Up to date N/A

Remarks THE SITE IS LOCATED WITHIN A SECURE AREA WITHIN A SECURE NAVAL FACILITY

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility ✓
Other_____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate_____ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS

(Applicable) N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured ✓ N/A

Remarks Fence + Gates are in Excellent condition - Gates Locked

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map ~~✓~~ N/A

Remarks Signs in prominent locations + easy to read

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes (No) N/A
Site conditions imply ICs not being fully enforced — Yes (No) N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Double Security ID Checks
Frequency Continuous
Responsible party/agency US Navy
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — (Yes) No N/A
Reports are verified by the lead agency — (Yes) No N/A

Specific requirements in deed or decision documents have been met — Yes No N/A
Violations have been reported — Yes No N/A
Other problems or suggestions: Report attached

NWS EARLE MASTER PLAN

2. **Adequacy** ICs are adequate yes ICs are inadequate N/A
Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map ✓ No vandalism evident
Remarks Gates are secured + locked. Drainage channel around landfill acts as deterrent to enter Landfill Cap area.

2. **Land use changes on site** N/A
Remarks None Apparent

3. **Land use changes off site** N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** No Location shown on site map ✓ Roads adequate ✓ N/A
Remarks Asphalt + Sand/clay roads adequate

B. Other Site Conditions

Remarks Sign & Fence/gate in excellent Condition

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map ✓ Settlement not evident
   Areal extent_____ Depth_____
   Remarks No Settlement Visible

2. **Cracks** Location shown on site map ✓ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks No cracks Visible

3. **Erosion** Location shown on site map ✓ Erosion not evident
   Areal extent_____ Depth_____
   Remarks None Evident

4. **Holes** Location shown on site map ✓ Holes not evident
   Areal extent_____ Depth_____
   Remarks No holes Visible

5. **Vegetative Cover** Grass ✓ Cover properly established ✓ No signs of stress ✓
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks A few shrub precursor species present. May need Cutting.

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks armored rock in drainage swale surrounds Site in good condition

7. **Bulges** Location shown on site map ✓ Bulges not evident
   Areal extent_____ Height_____
   Remarks None

8. **Wet Areas/Water Damage** ~~Wet areas/water damage not evident~~
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks None Visible On Land Fill Cap

9. **Slope Instability** Slides — Location shown on site map — ~~No evidence of slope instability~~
   Areal extent_____
   Remarks No Slides Seen

B. Benches Applicable (N/A)

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** — Location shown on site map — N/A or okay
   Remarks_____

2. **Bench Breached** — Location shown on site map — N/A or okay
   Remarks_____

3. **Bench Overtopped** — Location shown on site map — N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** — Location shown on site map — No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** — Location shown on site map — No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** — Location shown on site map — No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active (Passive)
Properly secured/locked Functioning Routinely sampled (Good condition)
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks Vents in Excellent Condition

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance (N/A)
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks Locked + Well maintained

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance (N/A)
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed (N/A)
Remarks_____

E. Gas Collection and Treatment Applicable (N/A)

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer (Applicable) N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks None seen.

2. **Outlet Rock Inspected** (Functioning) N/A
   Remarks No erosion evident

G. Detention/Sedimentation Ponds (Applicable) N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks two Sedimentation areas appear to be without excess Sedimentation –

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks None

3. **Outlet Works** (Functioning) N/A
   Remarks Good Condition – Some small cracks.

4. **Dam** Functioning (N/A)
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks No Silt – Some Vegetation may need Maintenance

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks No Silt accumulation – Some Vegetation

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks Consider Maintenance

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks None Evident

4. **Discharge Structure** Functioning N/A
   Remarks Good Condition

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	Applicable	N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal — Oil/water separation — Bioremediation
   - Air stripping — Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition — Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A — Good condition — Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A — Good condition — Proper secondary containment — Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A — Good condition — Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   N/A — Good condition (esp. roof and doorways) — Needs repair
   - Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   - Properly secured/locked — Functioning — Routinely sampled — Good condition
   - All required wells located — Needs Maintenance — N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained — Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

SAMPLE EVERY 2 YEARS

ANALYSIS FOR COPCs ONLY

(3)

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 19	**Date of inspection:** Jan. 10, 2003
Location and Region: NAS EARLE, REGION 2	**EPA ID:** NJ 0170022172
Agency, office, or company leading the five-year review:	**Weather/temperature:** Clear/Sunny/44°F

Remedy Includes: (Check all that apply)

✓ Landfill cover/containment	Monitored natural attenuation
✓ Access controls	Groundwater containment
✓ Institutional controls	Vertical barrier walls
Groundwater pump and treatment	
Surface water collection and treatment	
✓ Other LONG-TERM MONITORING — GROUNDWATER	

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks_____			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks_____			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits_____	Readily available	Up to date	N/A
	Remarks_____			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks_____			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks_____			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks_____			

IV. O&M COSTS

1. **O&M Organization**
   State in-house — Contractor for State
   PRP in-house — Contractor for PRP
   Federal Facility in-house — Contractor for Federal Facility
   Other_____

2. **O&M Cost Records**
   Readily available — Up to date
   Funding mechanism/agreement in place
   Original O&M cost estimate_____ Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost
   From_____ To_____ _____ Breakdown attached
   Date — Date — Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS

Applicable N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — Gates secured — N/A
   Remarks No Fencing or Signs

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A
   Remarks None

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	(No)	N/A
Site conditions imply ICs not being fully enforced	Yes	(No)	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	(Yes)	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

NWS EARLE MASTER PLAN

2. **Adequacy** (ICs are adequate) ICs are inadequate N/A
Remarks No Access For potential Groundwater exists - Secure Area (Ordnance)

D. General

1. **Vandalism/trespassing** Location shown on site map (No vandalism evident)
Remarks _____

2. **Land use changes on site** N/A
Remarks Parking Lot at Site is being used For Fork Lift training by Navy Personnel

3. **Land use changes off site** N/A
Remarks Fork Lift Training on adjacent lot

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map (Roads adequate) N/A
Remarks asphalt Roadway adequate

B. Other Site Conditions

Remarks This is a remot section of the NAVAC Facility that appears little used -

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** Slides — Location shown on site map — No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches Applicable N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map N/A or okay
   Remarks_____

2. **Bench Breached** Location shown on site map N/A or okay
   Remarks_____

3. **Bench Overtopped** Location shown on site map N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** Location shown on site map No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** Location shown on site map No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable (N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable (N/A)

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - Air stripping
   - Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition
   - Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - N/A
   - Good condition
   - Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   - N/A
   - Good condition
   - Proper secondary containment
   - Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   - N/A
   - Good condition
   - Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   - N/A
   - Good condition (esp. roof and doorways)
   - Needs repair
   - Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   - Properly secured/locked
   - Functioning
   - Routinely sampled
   - Good condition
   - All required wells located
   - Needs Maintenance
   - N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   - Is routinely submitted on time
   - Is of acceptable quality

2. Monitoring data suggests:
   - Groundwater plume is effectively contained
   - Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks Monitoring Wells Secured/Locked Appear in Good Condition

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

SAMPLE EVERY 2 YEARS

ANALYSIS FOR COPCs ONLY

D Visitor Visit

Site 26

Friday Jan. 10, 2003 ET

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 26	**Date of inspection:** Jan. 10, 2003
Location and Region: NWS EARLE, REGION 2	**EPA ID:** NJ0170022172
Agency, office, or company leading the five-year review:	**Weather/temperature:** Clear / 44°F

Remedy Includes: (Check all that apply)

Landfill cover/containment	Monitored natural attenuation
✓ Access controls	Groundwater containment
✓ Institutional controls	Vertical barrier walls
Groundwater pump and treatment	
Surface water collection and treatment	

Other Air Sparge Soil Vapor Extraction

Attachments: Inspection team roster attached RETonly Site map attached See Report

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks_____			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks_____			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits_____	Readily available	Up to date	N/A
	Remarks_____			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks_____			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks_____			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks_____			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other_____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate_____ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

From_____ To_____ _____ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS — Applicable — N/A

A. Fencing

1. **Fencing damaged** NO Location shown on site map yes Gates secured yes N/A
Remarks Sign on Fence Says "In Case of Emergency - Contact Mike Peterson 215 796 1415 - Clearly Readable

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map yes N/A
Remarks Signs Posted on Fence - Restricted Area Notice

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes (No) N/A

Site conditions imply ICs not being fully enforced — Yes (No) N/A

Type of monitoring (*e.g.*, self-reporting, drive by) This Site is Located in a restricted Access Area of the Naval base

Frequency - Base Security Personnel Log all visitors in and out -

Responsible party/agency _____ Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date — (Yes) No N/A

Reports are verified by the lead agency — Yes No (N/A)

Specific requirements in deed or decision documents have been met — (Yes) No N/A

Violations have been reported — Yes No (N/A)

Other problems or suggestions: Report attached

Two Levels of ID check required just to enter the Area. In Addition, Site Fence is Secured & Locked.

NWS EARLE MASTER PLAN

2. **Adequacy** (ICs are adequate) ICs are inadequate N/A

Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map Yes No vandalism evident

Remarks

2. **Land use changes on site** N/A

Remarks None - SVE System installed and in Operation

3. **Land use changes off site** N/A

Remarks None Apparent

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Yes Roads adequate Yes N/A

Remarks

B. Other Site Conditions

Remarks Site Appears to be well maintained with high (8') Security Fence topped by three strands of barbed wire. The system showed signs of running (sounds from compressors + surging water).

VII. LANDFILL COVERS Applicable (N/A)

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** Slides — Location shown on site map — No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches Applicable N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map N/A or okay
   Remarks_____

2. **Bench Breached** Location shown on site map N/A or okay
   Remarks_____

3. **Bench Overtopped** Location shown on site map N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** Location shown on site map No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** Location shown on site map No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	Applicable	N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition yes All required wells properly operating Needs Maintenance N/A
   Remarks Plumbing/Electro Mechanical appurtenances seem to be Well maintained and in Continuous operation

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition yes Needs Maintenance no
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks Unknown

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

C. Treatment System ✓Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - ✓Air stripping
   - Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition
   - Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - N/A
   - ✓Good condition
   - Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   - N/A
   - Good condition
   - Proper secondary containment
   - Needs Maintenance

   Remarks No problems evident

4. **Discharge Structure and Appurtenances**
   - N/A
   - ✓Good condition
   - Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   - N/A
   - ✓Good condition (esp. roof and doorways)
   - Needs repair
   - Chemicals and equipment properly stored

   Remarks No deficiencies apparent

6. **Monitoring Wells** (pump and treatment remedy)
   - ✓Properly secured/locked
   - ✓Functioning
   - Routinely sampled
   - Good condition
   - ✓All required wells located
   - Needs Maintenance
   - N/A

   Remarks Good Condition & Operating

D. Monitoring Data

1. Monitoring Data
   - Is routinely submitted on time
   - Is of acceptable quality

2. Monitoring data suggests:
   - Groundwater plume is effectively contained
   - Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

This ASVE System is in Good order and apparently functioning well without major problems. Appearance of all systems is excellent.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

(4)

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 3	**Date of inspection:** Jan. 0, 2003
Location and Region: NWS EARLE, REGION 2	**EPA ID:** NJ0170022172
Agency, office, or company leading the five-year review:	**Weather/temperature:** Sunny / 42°F

Remedy Includes: (Check all that apply)

✓ Landfill cover/containment	Monitored natural attenuation
✓ Access controls	Groundwater containment
✓ Institutional controls	Vertical barrier walls
Groundwater pump and treatment	Remedy is Under Construction
Surface water collection and treatment	
✓ Other LONG TERM MONITORING - GROUNDWATER	

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

Site Landfill Cap is under Construction

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks			
10.	✓ **Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks THE SITE IS LOCATED WITHIN A SECURE NAVAL FACILITY			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other_____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate_____ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ Breakdown attached
Date — Date — Total cost

From_____ To_____ _____ Breakdown attached
Date — Date — Total cost

From_____ To_____ _____ Breakdown attached
Date — Date — Total cost

From_____ To_____ _____ Breakdown attached
Date — Date — Total cost

From_____ To_____ _____ Breakdown attached
Date — Date — Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS

(Applicable) N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — Gates secured — N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes No N/A
Site conditions imply ICs not being fully enforced — Yes No N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — Yes No N/A
Reports are verified by the lead agency — Yes No N/A

Specific requirements in deed or decision documents have been met — Yes No N/A
Violations have been reported — Yes No N/A
Other problems or suggestions: Report attached

NW3 EARLE MASTER PLAN

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks_____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks_____

2. **Land use changes on site** N/A
Remarks_____

3. **Land use changes off site** N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks_____

B. Other Site Conditions

Remarks_____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS (Applicable) N/A UNDER CONSTRUCTION

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____
   _____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** Slides — Location shown on site map — No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches Applicable N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** — Location shown on site map — N/A or okay
   Remarks_____

2. **Bench Breached** — Location shown on site map — N/A or okay
   Remarks_____

3. **Bench Overtopped** — Location shown on site map — N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** — Location shown on site map — No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** — Location shown on site map — No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** — Location shown on site map — No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable (N/A)

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable (N/A)

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal
   - Oil/water separation
   - Bioremediation
   - Air stripping
   - Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition
   - Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

(5)

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 10	**Date of inspection:** Jan. 10, 2003
Location and Region: NWS EARLE, REGION 2	**EPA ID:** NJ 0170022172
Agency, office, or company leading the five-year review:	**Weather/temperature:** Partly Cloudy / 42°F

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- ✓ Other LONG TERM MONITORING - GROUNDWATER (Landfill Cap)
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Remedy is under Construction

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; Report attached _____
_____

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks_____			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks_____			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits_____	Readily available	Up to date	N/A
	Remarks_____			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks_____			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks_____			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks_____			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other_____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate_____ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS

Applicable N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A

Remarks_____

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented — Yes No N/A
Site conditions imply ICs not being fully enforced — Yes No N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date — Yes No N/A
Reports are verified by the lead agency — Yes No N/A

Specific requirements in deed or decision documents have been met — Yes No N/A
Violations have been reported — Yes No N/A
Other problems or suggestions: Report attached

NWS EARLC MASTER PLAN

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks _____

2. **Land use changes on site** N/A
Remarks _____

3. **Land use changes off site** N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks _____

B. Other Site Conditions

Remarks_____

_____

_____

_____

_____

_____

VII. LANDFILL COVERS Applicable N/A UNDER CONSTRUCTION

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____
   _____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____
   _____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____
   _____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____
   _____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____
   _____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
   - Wet areas — Location shown on site map — Areal extent_____
   - Ponding — Location shown on site map — Areal extent_____
   - Seeps — Location shown on site map — Areal extent_____
   - Soft subgrade — Location shown on site map — Areal extent_____

   Remarks_____

9. **Slope Instability** Slides — Location shown on site map — No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches Applicable N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map N/A or okay
   Remarks_____

2. **Bench Breached** Location shown on site map N/A or okay
   Remarks_____

3. **Bench Overtopped** Location shown on site map N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** Location shown on site map No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** Location shown on site map No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment Applicable N/A

1. **Gas Treatment Facilities**
   Flaring Thermal destruction Collection for reuse
   Good condition Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   Good condition Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   Good condition Needs Maintenance N/A
   Remarks_____

F. Cover Drainage Layer Applicable N/A

1. **Outlet Pipes Inspected** Functioning N/A
   Remarks_____

2. **Outlet Rock Inspected** Functioning N/A
   Remarks_____

G. Detention/Sedimentation Ponds Applicable N/A

1. **Siltation** Areal extent_____ Depth_____ N/A
   Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   Erosion not evident
   Remarks_____

3. **Outlet Works** Functioning N/A
   Remarks_____

4. **Dam** Functioning N/A
   Remarks_____

H. Retaining Walls Applicable (N/A)

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal — Oil/water separation — Bioremediation
   - Air stripping — Carbon adsorbers
   - Filters_____
   - Additive (*e.g.*, chelation agent, flocculent)_____
   - Others_____
   - Good condition — Needs Maintenance
   - Sampling ports properly marked and functional
   - Sampling/maintenance log displayed and up to date
   - Equipment properly identified
   - Quantity of groundwater treated annually_____
   - Quantity of surface water treated annually_____

   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A — Good condition — Needs Maintenance

   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A — Good condition — Proper secondary containment — Needs Maintenance

   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A — Good condition — Needs Maintenance

   Remarks_____

5. **Treatment Building(s)**
   N/A — Good condition (esp. roof and doorways) — Needs repair
   Chemicals and equipment properly stored

   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked — Functioning — Routinely sampled — Good condition
   All required wells located — Needs Maintenance — N/A

   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained — Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

OCT 24 2002

Ms. Michele DiGeambeardino
Remedial Project Manager
EV 21/MD
10 Industrial Highway
Mail Stop, 82
Lester, PA 19113-2090

Re: Quarterly Monitoring of Site 19, Naval Weapons Station Earle

Dear Ms. DiGeambeardino:

I have received the Navy's letter dated September 26, 2002, requesting a change of the quarterly long term monitoring at Site 19 to yearly monitoring. After reviewing the data, I have no further comments and concur with the Navy's request. Therefore, a reduction of the sampling frequency from quarterly to annually is hereby approved and may begin at the Navy's convenience. Furthermore, I have no comments with regards to including up-gradient monitoring wells MW 19-01 and MW 19-04 in the first annual monitoring event.

Should you have any further questions, please contact me at (212) 637-4432.

Sincerely,

Douglas M. Pocze
Remedial Project Manager

APPENDIX D

APPROVAL FOR ENGINEERING REMEDY AT SITES 3 AND 10 (OU-6)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

JUL 22 2002

Captain J.W. Zorica
Commanding Officer
Engineering Field Activity Northeast (EFANE)
10 Industrial Highway, Mailstop #82
Lester, PA 19113

Re: Letter of Approval for Engineering Remedies for Sites 3 and 10 at Naval Weapons Station Earle

Dear Captain Zorica:

EPA Region II and Naval Weapons Station Earle have been unable to reach agreement on the final Record of Decision (ROD) at Sites 3 and 10. Specifically, Naval Weapons Station Earle and EPA Region II have been unable to come to complete agreement on commitments for institutional control implementation and related other post-ROD requirements, including an Institutional Controls Implementation Plan (especially with respect to regularly scheduled site inspections and reporting) in the ROD to ensure that the remedies are and will remain protective. Because these issues are part of a continuing national dispute between EPA and DoD, resolution of these issues at the facility level is not expected in the near future.

Without fully agreed to commitments in the ROD for institutional control implementation where required (i.e., where the engineering components of the remedy are not in themselves sufficient to protect human health or the environment) and post-ROD oversight, EPA cannot ensure that the remedy is protective and will remain so in the future. EPA will not approve an unprotective ROD.

From phone conversations between our respective staffs on May 17, 2002 and May 30, 2002, it was agreed that the Navy would not unilaterally sign and issue a final ROD for these sites without EPA's concurrence. Both parties have agreed that this letter would suffice for the Navy's contractor to begin work on the engineered components of the remedy while the final ROD awaits the resolution of the national dispute process on institutional controls and post-ROD requirements.

At Naval Weapons Station Earle, our agencies are in agreement about the engineered components of the remedy (landfill caps) as they are specifically described in the approved Proposed Plan and draft ROD for sites 3 and 10. Achieving cleanup goals is of paramount importance and neither EPA nor DoD wants to delay any cleanup activities while we are resolving this dispute. We urge you to continue cleanup and to also make certain that institutional controls are in place to protect the public, facility personnel and the environment during cleanup. EPA Region II may revisit the anticipated remedy if provisions for institutional controls implementation and post-ROD oversight are not part of the final ROD or other enforceable document.

EPA Region II will share this letter with the Naval Weapons Station Earle Restoration Advisory Board (RAB), and it should also be placed in the Administrative Record. We look forward to continuing our constructive relationship with Naval Weapons Station Earle while this debate is resolved at the national level.

Should you have any questions with regard to this letter, please feel free to contact me or have your staff contact Robert Wing, Chief, Federal Facilities Section at (212) 637-4332.

Sincerely,

Jane M. Kenny
Regional Administrator

cc: B. Campbell, NJDEP
R. Marcolina, NJDEP
M. DiGeambeardino, Navy-Northern Div.
L. Burg, Navy-Earle
L. Jargowsky, Earle-RAB Chair